TRANSACTIONS

OF THE

NORFOLK & NORWICH

NATURALISTS' SOCIETY.

[EDITED BY W. H. BIDWELL, HON. SEC.]

The Norfolk and Norwich Naturalists' Society has for its objects :—

1. The Practical study of Natural Science.

2. The protection, by its influence with landowners and others, of indigenous species requiring protection, and the circulation of information which may dispel prejudices leading to their destruction.

3. The discouragement of the practice of destroying the rarer species of birds that occasionally visit the County, and of exterminating rare plants in their native localities.

4. The record of facts and traditions connected with the habits, distribution, and former abundance or otherwise of animals and plants which have become extinct in the County; and the use of all legitimate means to prevent the extermination of existing species, more especially those known to be diminishing in numbers.

5. The publication of Papers on Natural History, contributed to the Society, especially such as relate to the County of Norfolk.

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VOL. IV.

1884—85 TO 1888—89.

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1889.

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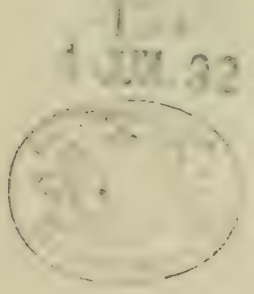

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NATURALISTS' SOCIETY;

PRESENTED TO THE MEMBERS FOR

1884—85.

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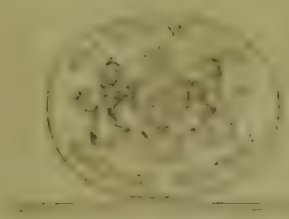

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1885.

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To Balance from last year	28	16	9
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1 for 1881–82 ... ... £0 5 0			
3 ,, 1882–83 ... ... 0 15 0			
10 ,, 1883–84 ... ... 2 10 0			
1 ,, 1884–85 ... ... 0 10 0			
199 ,, 1884–85 ... ... 49 15 0			
8 ,, 1885–86 ... ... 2 0 0			
	55	15	0
,, Additional payments for monthly summons ...	0	17	0
,, Sale of *Transactions*	4	5	6
,, Interest	1	1	4
	£90	15	7

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,, Gratuity to Doorkeeper	0	10	0
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,, Museum Subscription	2	2	0
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	£	s.	d.
To Balance from last year	61	5	4
,, 2 Compositions for Membership	6	0	0
,, Interest	1	0	3
	£68	5	7

By Balance in Post Office Savings Bank £68 5 7

Norwich, 30th March, 1885.

Examined and found correct,
STEPHEN WM. UTTING, *Auditor.*

List of the Publications received by the Society as Donations or Exchanges from March, 1884, to March, 1885.

ANALYST.

The Analyst: a Journal of Science, Literature, and the Fine Arts. Vols. i.—iv. 8vo. *Lond.* 1834—36

From Mr. J. H. Gurney, Jun., F.Z.S.

BANBURY.

A List of the Birds of the Banbury District. By F. C. Aplin, Rev. B. d'O. Aplin, and Oliver V. Aplin. pp. 29. 8vo. *Banbury*, 1882

From the Authors.

BATH.

Proceedings of the Bath Natural History and Antiquarian Field Club. Vol. v. no. 3. 8vo. *Bath*, 1884

From the Bath Field Club.

BELFAST.

Annual Report and Proceedings of the Belfast Naturalists' Field Club. Series ii. vol. ii. part 4. 8vo. *Belfast*, 1884

From the Belfast Naturalists' Field Club.

BERWICKSHIRE.

Proceedings of the Berwickshire Naturalists' Club. Vol. x. no. 2. 8vo. 1884

From the Berwickshire Naturalists' Club.

BIRDS.

Report on the Migration of Birds in the Spring and Autumn of 1880. 8vo. *Lond.* 1881

From Mr. T. Southwell, F.Z.S.

Report on the Migration of Birds. Fifth Report, 1883. 8vo. *Lond.* 1884

From Mr. John Cordeaux.

BRIDGMAN (J.B., F.L.S.).

Further additions to Mr. Marshall's Catalogue of British Ichneumonidæ. [From 'The Transactions of the Entomological Society,' 1884, part iii. pp. 421–433.]

From the Author.

BRISTOL.

Proceedings of the Bristol Naturalists' Society. New Series, vol. iv. part 2. 8vo. *Bristol*, 1884

From the Bristol Naturalists' Society.

CARDIFF.

Cardiff Naturalists' Society. Report and Transactions. Vol. xv. 8vo. *Cardiff*, 1884

From the Cardiff Naturalists' Society.

CROYDON.

Proceedings and Transactions of the Croydon Microscopical and Natural History Club, from Feb. 14th, 1883, to Jan 9th, 1884. 8vo. *Croydon*, 1884

From the Croydon Club.

CUMBERLAND.

Transactions of the Cumberland Association for the Advancement of Literature and Science. No. viii. 1882—83. 8vo. *Carlisle*, 1883

From Mr. H. B. Woodward, F.G.S.

DAWKINS (W. BOYD, F.R.S.).

On the alleged Existence of Ovibos moschatus in the Forest-bed and its Range in Space and Time. [From the Quarterly Journal of the Geological Society, for Nov. 1883.] pp 7. 8vo.

From Mr. A. F. Buxton.

EASTBOURNE.

Transactions of the Eastbourne Natural History Society. New series. Vol. i. parts 5 and 6. 8vo. *Eastbourne*, 1885

From the Eastbourne Natural History Society.

EDINBURGH.

Transactions and Proceedings of the Botanical Society. Vol. xv. part 1. 8vo. *Edinburgh*, 1884

From the Edinburgh Botanical Society.

Proceedings of the Royal Society of Edinburgh. Nos. 111, 112, 113. 8vo. *Edinburgh*, 1882—83

From the Royal Society of Edinburgh.

Proceedings of the Royal Physical Society of Edinburgh. Vols. 4, 5, 6, 7, and 8, part i. 8vo. *Edinburgh*, 1878—84

From the Royal Physical Society of Edinburgh.

ESSEX.

Transactions of the Essex Field Club. Vol. iii. part 7, and first appendix to Vol iv. 8vo. *Buckhurst Hill*, 1884

From the Essex Field Club.

FORESTRY.

The Journal of Forestry and Estates Management: A Monthly illustrated Magazine devoted to the Science and Practice of Arboriculture and the general Management of Estates. 4 vols. roy 8vo. *Lond.* 1878—81

From Mr. John Gurney, F.Z.S.

GUNN (T. E., F.L.S.).

Ornithological Invasions of East Anglia. [Reprinted from the 'East Anglian Handbook.'] 8vo. *Norwich*, 1885

From the Author.

GURNEY (JOHN HENRY, F.Z.S.).

A List of the Diurnal Birds of Prey, with references and annotations; also, a Record of Specimens preserved in the Norfolk and Norwich Museum. 8vo. *Lond.* 1884

From the Author.

GURNEY (JOHN HENRY, JUN., F.Z.S.).

A Catalogue of the Birds of Norfolk. [Reprinted from Mason's 'History of Norfolk.'] 12mo. *Lond.* 1884

From the Author.

HERBERT (HENRY WILLIAM).

Frank Forester's Fish and Fishing of the United States, and British Provinces of North America. 8vo. *Lond.* 1849

From Mr. James Reeve.

HERTFORDSHIRE.

Transactions of the Hertfordshire Natural History Society and Field Club. Vol. iii. parts 1 to 4. 8vo. *Watford,* 1884-85

From the Hertfordshire Natural History Society.

HOLMESDALE.

Proceedings of the Holmesdale Natural History Club for the years 1881, 1882, 1883. 8vo. *Lond.* 1884

From the Holmesdale Natural History Club.

LIVERPOOL.

Proceedings of the Liverpool Naturalists' Field Club, for the year 1883—84. 8vo. *Liverpool,* 1884

From the Liverpool Naturalists' Field Club.

LONDON.

Proceedings of the Royal Geographical Society and Monthly Record of Geography; from April, 1884, to March, 1885. Roy. 8vo. *Lond.* 1884—85

From Mr. H. G. Barclay, F.R.G.S.

Journal of the Royal Microscopical Society. Second series, vol iv. parts 2—6, and vol. v. part i. Roy. 8vo. *Lond.* 1884—85

From the Royal Microscopical Society.

The Journal of the Quekett Microscopical Club. Second series, vol. i. nos. 8—11. 8vo. *Lond.* 1884—85

From the Quekett Microscopical Club.

Proceedings of the Royal Institution of Great Britain. Vol x. part 3. 8vo. *Lond.* 1884

From the Royal Institution.

NEW ZEALAND.

Transactions and Proceedings of the New Zealand Institute, 1883. Vol. xxi. Roy. 8vo. *Wellington,* 1884

From the New Zealand Institute.

The New Zealand Journal of Science. Vol i. nos. 1, 2, 3, 5, 6; 7, 9, 11. Roy. 8vo. *Dunedin, N. Z.* 1882—83

From Mr. E. T. Dowson.

NORTHAMPTONSHIRE.

Journal of the Northamptonshire Natural History Society and Field Club. Nos. 17—20. 8vo. *Northampton,* 1884

From the Northamptonshire Field Club.

NORTHUMBERLAND.

Natural History Transactions of Northumberland, Durham, and Newcastle-upon-Tyne. Vol. 8, part i. 8vo. *Lond.* 1884

From the Natural History Society of Northumberland.

NORWAY.

The Norwegian North Atlantic Expedition, 1876–1878. [In Norwegian and English.] Part 11. Folio. *Christiania*, 1884

Contents:—

Asteroidea. By D. C. Danielssen and Johan Koren. With 15 plates and 1 map.

From Professor Newton, F.R.S.

NORWICH.

Proceedings of the Norwich Geological Society. Vol. i. part 8. 8vo. *Norwich*, 1884

From Mr. James Reeve.

PARIS.

Feuille des Jeunes Naturalistes. Nos. 162—173. Roy. 8vo. *Paris*, 1884—85

From La Feuille des Jeunes Naturalistes.

PENZANCE.

Penzance Natural History and Antiquarian Society. Report and Transactions, 1883—84. 8vo. *Plymouth*, 1884

From Mrs. Luscombe.

PIGOTT (T. DIGBY, F.R.G.S.).

London Birds and London Insects. Sm. 8vo. *Lond.* [1884]

From the Author.

PLYMOUTH.

Annual Report and Transactions of the Plymouth Institution and Devon and Cornwall Natural History Society. Vol. viii. part 3, 1883—84. 8vo. *Plymouth*, 1884

From the Plymouth Institution.

QUEENSLAND.

The Proceedings of the Royal Society of Queensland. Vol. i. part 1. 8vo. *Brisbane*, 1884

From the Royal Society of Queensland.

REID (CLEMENT, F.G.S.).

Dust and Soils. [Extracted from the Geological Magazine for April, 1884.] pp. 4. 8vo. *Lond.* 1884

From the Author.

RETZIUS (PROFESSOR GUSTAF, D.M.).

Das Gehörorgan der Wirbelthiere Morphologisch-Histologische Studien, von Gustaf Retzius, Dr. Med. II. Das Gehörorgan der Reptilien, der Vögel und der Säugethiere. Folio. *Stockholm*, 1884

From Professor Newton, F.R.S.

RUSSIA.

Bulletin de la Société Impériale des Naturalistes de Moscou. Année, 1883. Nos. 3—4. Année, 1884. Nos. 1—2. 8vo. *Moscou*, 1884

From La Société Impériale des Naturalistes de Moscou.

UNITED STATES OF AMERICA.

Annual Report of the Board of Regents of the Smithsonian Institution, showing the operations, expenditures, and condition of the Institution, for the year 1882. 8vo. *Washington*, 1884

From the Smithsonian Institution.

United States of America.

Second and Third Annual Reports of the United States Geological Survey, to the Secretary of the Interior, 1880—81, 1881—82. By J. W. Powell, Director. Imp. 8vo. *Washington*, 1882—83

From the U. S. Geological Survey Office.

Twelfth Annual Report of the United States Geological and Geographical Survey of the Territories: a Report of progress of the Exploration in Wyoming and Idaho for the year 1878. In two parts, with portfolio containing 10 Maps and Panoramas. 8vo. *Washington*, 1883

Bulletin of the United States Geological and Geographical Survey of the Territories. Vol. vi. nos. 1, 2, 3. 8vo. *Washington*, 1881—82.

Third Report of the United States Entomological Commission, relating to the Rocky Mountain Locust, the Western Cricket, the Army Worm, Canker Worms, and the Hessian Fly. With Maps and Illustrations. 8vo. *Washington*, 1883

Compendium of the Tenth Census (June 1, 1880), compiled pursuant to an Act of Congress approved August 7, 1882. 2 vols. 8vo. *Washington*, 1883

From Dr. F. V. Hayden.

Bulletins of the American Museum of Natural History. Vol. i. nos. 1—5. 8vo. *New York*, 1881—84

The Fifteenth Annual Report of the American Museum of Natural History. 8vo. *New York*, 1884

From the American Museum.

Cruise of the Revenue-Steamer Corwin in Alaska and in the N.W. Arctic Ocean in 1881. 4to. *Washington*, 1883

From Major Feilden, F.G.S.

United States Commission of Fish and Fisheries. Part ii. Report of the Commissioner for 1872 and 1873. 8vo. *Washington*, 1874

From Mr. R. M. Brereton.

Walsingham (Lord).

On some probable causes of a tendency to melanic variation in Lepidoptera of high Latitudes. Being the Annual Address of the President to the Members of the Yorkshire Naturalists' Union, at Doncaster, March 3rd, 1885. pp. 28. 8vo.

From the Author.

Wood (Neville).

The Ornithologists' Text-Book: being Reviews of Ornithological Works. 12mo. *Lond.* 1836

From Mr. J. H. Gurney, Jun., F.Z.S.

Yorkshire.

Transactions of the Yorkshire Naturalists' Union. Part 7. 8vo. *Lond.* 1884

From the Yorkshire Naturalists' Union.

ADDRESS.

Read by the President, Mr. Francis Sutton, F.C.S., *to the Members of the Norfolk and Norwich Naturalists' Society, at their Sixteenth Annual Meeting, held at the Norfolk and Norwich Museum, March 31st, 1885.*

Ladies and Gentlemen,—Another year in the history of this Society has passed since you did me the honour of electing me as President, during which I fear I have not been able to do much in the way of contributing original matter to its meetings. I have done as much however as my busy occupations have allowed me; and have the satisfaction of knowing that my place will be taken by a gentleman who is in every way fitted to fill the post of President, with honour to himself, and benefit to our Society.

Before calling attention to the papers, which have been read during the past year, allow me to congratulate you on the continued prosperity of the Society. The number of members has now increased to 250, and although we have but a small balance in hand, the amount of the Life-Membership Fund fully justifies, in the opinion of your Committee, the large expenditure on the publication of the last number of the 'Transactions.' The Treasurer's report, however, not only notices the progress made by the Society, but reminds us of "the annual tribute Death requires," and enumerates those whose names must now be removed from our list of Members.

Sir Willoughby Jones, one of our Vice-Presidents, died 21st August, 1884. He was well known in the county, having been Chairman of Quarter Sessions for thirty years, an office for which his sound judgment and courtesy, combined with a legal training,

peculiarly fitted him. Though an archæologist and geologist, rather than a naturalist, he always took an interest in this Society; and those who went the excursion to Houghton in the summer of 1880, will not forget the kindness and hospitality shown them at Cranmer Hall on their return. Sir Willoughby published in 1863, 'Christianity and Common Sense.'

Lady Stracey, who died suddenly in April of last year, was daughter and heiress of George Denne, Esq., of Canterbury, and wife of Sir Henry Stracey of Rackheath. She was spoken of by those who knew her as "self-sacrificing, sympathetic, and unostentatious, and displaying in her daily life the choicer and rarer traits of womanhood."

The death of Mr. John Orfeur, who, though in his eightieth year was one of the active members of our Society, removed a well-known face from our evening meetings, at which he was a very regular attendant, and deprived us of the services of an excursion secretary, whose exertions for the comfort of those who attended the summer gatherings has been recognized at these meetings from year to year. Mr. Orfeur was for many years the Treasurer of the Norwich Geological Society, and an active supporter of the Norfolk and Norwich Museum.

Though not a member of our Society, Mr. Robert Rising, of Horsey, was so well known to Norfolk Naturalists, that I may quote the obituary notice of him in the 'Norfolk Chronicle' of the 14th of this month :—"Born, we believe, at Horsey, Mr. Rising was educated at the Norwich Grammar School, under Valpy, and was a constant attendant at the annual gatherings of the Valpeian Club, in this city, and has survived, only by a few weeks, his octogenarian schoolfellow, Mr. F. A. Mills,—his senior by one year. Mr. Rising, like his old friend, was, in former years, a keen sportsman and thorough outdoor naturalist, such tastes having been early fostered by the surroundings of his father's residence at Horsey (an estate purchased by him at the commencement of the present century), and which, though vastly improved, and at a considerable outlay, by drainage, embankment, and other agricultural improvements,

retained, over a wide area, its normal condition of reed-beds, treacherous bogs, and watery wastes. In this paradise for the fowler and collector, the resort in those days of all marsh-loving birds, whether migrants from the coast in spring and autumn, fowl of all kinds in hard winters, or species, annually, remaining to breed in summer, now rare, or wholly extinct in the county,—Mr. Rising acquired that intimate knowledge of bird life which such opportunities can alone afford; with the eye and ear alike trained by constant and careful observation. It is, indeed, to be regretted that the fund of information he was ever ready to impart to others, of like tastes and pursuits, was not gathered, as in the case of the Rev. Richard Lubbock, into a volume on local Ornithology. Fortunately, however, in the fine collection of birds preserved at his house, are most of the rarities that have been killed during many years past at Horsey, and the neighbouring coast line, with other objects of interest; and, though the absorbing nature of his public duties had long deprived Mr. Rising of the leisure to enjoy his favourite pastime, the visit of a brother naturalist, by road or rail, or when yachting in the vicinity of Horsey Mere, was always a pleasure to him; and his hospitable welcome, and genial manner in describing, from a well-stored memory, the treasures of his collection, was a treat to be remembered by those fortunate enough to find so busy a man at home."

With one exception, all the papers read at our evening meetings will be published: a brief notice of them will therefore be all that you require of me. To Mr. Corder we are indebted for a paper on "Saffron." Mr. Corder also read a note on a Poppy, *Glaucium fulvum*, a native of southern Europe, which flowered last summer in his garden near Mousehold, on some ground which had been recently trenched, and which he took to be the Orange Poppy mentioned by Sir Thomas Brown as occasionally springing up in the neighbourhood of Norwich in his time. At the same meeting Mr. Southwell read a paper on the "Reproduction of the Eel."—which, I regret to say, will not appear in the 'Transactions' of

this Society,—epitomising the important contributions to the life history of that fish made by continental observers, chiefly at the great Eel fishery of Commachio on the Adriatic. After briefly reviewing the various theories with regard to the reproduction of the fresh-water Eel advanced by naturalists, from Aristotle, who wrote four centuries before Christ, to almost the present time, he showed that it was not till the year 1777 that the female generative organs of the Eel were at length discovered and described by Carlo Mondini, of Bologna, the truth of whose observations were not fully admitted till finally confirmed by Rathke in 1850, to whose good fortune it fell to become possessed of the first and only specimen of a pregnant Eel, which so far had been seen by a naturalist. With regard to the male Eel, Mr. Southwell said it was not till the year 1842 that any decided opinion as to its sexual organs appeared, and then all the chief anatomists, misled by an appearance which he described, were of opinion that in the same Eel were found the reproductive organs of both sexes—that they were complete hermaphrodites. It was not till November, 1873, that Dr. Syrski, of Trieste, virtually solved the problem; but it remained for Dr. Jacoby in 1877 to establish the truth of Dr. Syrski's observations, and fully describe the organ which had been discovered by the latter and called after his name. In no case up to the present time has an individual of the fresh-water Eel of either sex been discovered in which the sexual organs were fully developed. After describing the reproductive organs in each sex of the Eel, and by means of dissections showing them *in situ*, as well as exhibiting them more fully by means of enlarged drawings, Mr. Southwell called to his aid Mr. F. Kitton, who by means of the microscope exhibited a beautifully-mounted slide which he had prepared, showing a small portion of the ovary of an Eel in which the ova and their contents were distinctly visible, thus removing any doubts as to the nature of the organ which had just been seen in the flesh. The result of repeated and long-continued observation and experiment leads to the following conclusions—that for the development of their organs of generation, Eels need

salt water, and that it is for this purpose they emigrate in autumn to the sea. Considering the immature condition of the Eels when they begin to emigrate, their development in salt water must be exceedingly rapid, and it is probable that the process is so exhausting that both males and females die soon after spawning. This would account for their not being seen returning from the sea. The Eel known to us as the Broad-nosed Eel, which is found in ponds, and does not migrate, is said to be the barren female; the Sharp-nosed Eel is the fertile fish, which on its seaward migration is intercepted by the fixed engines of the fishermen, there being a slight difference between the two sexes, which is appreciated by the fishermen.

A paper on "Varieties of Sugar," natural and artificial, was communicated by myself. It was hastily put together, but it occurred to me that at the present time, when sugar is being produced both naturally and artificially in quite astonishing quantities, the subject would be of interest to the Members, and I believe this result was fulfilled. The paper will be printed in full.

I also contributed a paper on "Water from a Well at Kirby Bedon," which has produced some little excitement among geologists, inasmuch as it reveals a condition of things unknown in this district; that is to say, a water of abnormally high temperature, and containing very large proportions of iron, sulphuric acid, and magnesia, and no carbonate of lime. As the discussion on this paper is postponed to the next meeting, I will refrain from further mention of it.

Mr. H. B. Woodward has contributed an addition to his paper on "Earthquakes in Norfolk," in which he has given an account of that which occurred in April, 1884. Mr. Power has given us notes of the "Autumnal Migration of Birds," observed by him at Cley; and Mr. J. H. Gurney, Junr., a paper on the same subject, in which he has drawn up a comparative table of simultaneous migration to Heligoland and to England.

Mr. Bridgman read notes on a Wasps' Nest at the February meeting, describing the Wasps and their cells, and also the parasites

which prey on the larvæ of Wasps. Mr. Whittaker's paper on "Abnormal Plumage," read at the same meeting, will also be published. Mr. Southwell gives us his annual "Notes on the Herring Fishery;" and Mr. Preston his "Meteorological Notes" for the year.

In continuation of the biographical notices of old Norfolk Naturalists, Professor Newton has contributed a memoir of the late John Scales, whose name was so intimately connected with the Ornithology of the county in the first half of the present century. For the portrait which accompanies the memoir, we are also indebted to the liberality of Professor Newton.

The subject to which I wish to draw your attention this evening, is one with which probably the greater number of Members of this Society are not familiar; but it is one of great and growing interest, and one which, I think, is strictly within the province of such a Society as this to entertain. It is upon the enormous influence of minute organisms in the Kingdom of Nature. It is not possible within the limits of our time to do more than briefly allude to the general character of the changes promoted by these minute and low types of life; but the last ten or twelve years have been prolific in evidence of their existence, and of the vast influence which they are secretly and silently exerting upon ourselves and our surroundings. These organisms are identified to us under the names of Microzymes (*i.e.* minute ferments), Micrococci, &c., and more specifically as Bacteria, Bacilli, etc.

It is true that one of the earliest, and certainly one of the cleverest, of microscopists was acquainted by observation with the forms of these objects, namely, Leuwenhoek, who, just two hundred years ago, recorded that he found very minute living objects of this character in the fluids of the mouth and nose of his own person. Any further study as to the natural economy of such objects, or of the kind of work in which they were occupied, seems to have remained in abeyance until very recent times. Every one is probably now familiar with the elaborate researches of

Pasteur, Koch, Lister, Tyndal, Dallinger, and a host of similar workers.

To Pasteur especially are we indebted for a most laborious and painstaking series of observations on the behaviour of these organisms in certain diseases, and in the fermentation of vegetable fluids. The details of many of these investigations and discoveries are as thrilling as any romance; but they possess the merit of being sound and trustworthy in their deductions.

I had the good fortune to pay a visit to the Ecole Normale when in Paris in 1883; but though unfortunate in not seeing Pasteur, who was out for his annual holiday, I was introduced to his co-worker, M. Chamberlan, and had the opportunity of seeing the vast array of flasks and bottles, all systematically labelled and dated, in which experiments were being recorded, extending over months and years: also the menagerie of fowls and animals, kept in great number and variety, for experimental purposes. One could not but be impressed with the feeling, that the patient laborious work of observation, undertaken with infinite pains by this remarkable man, was a labour of love, and showed the characteristics of a master mind.

The exact nature of these minute forms of life has given rise to a good deal of controversy, some authorities claiming them for the animal, and others the vegetable kingdom. The exact functions also of these bodies is to some extent a moot point; some contending that they are the direct agents of change, whether of growth, decay, health, disease, or putrefaction; others, that they are merely the concomitants of these changes. Whatever doubt there may be about Koch's Cholera Bacillus, I think the experiments of Pasteur in connection with fowl cholera and splenic fever settle the point, inasmuch as he was able to separate and purify the microbes from all surrounding material, and subsequently inoculate healthy animals, and so reproduce the specific disease in all its virulence.

With respect to the nature of these bodies, it is of course very difficult to say whether they should be classed as animals or

plants. The line of demarcation in such forms of life has always been obscure; but I see no reason why they should not belong to both. Certainly we are accustomed to regard a ferment, such as yeast, or the natural ferment contained on the skins of the grape, as vegetable bodies; so also with microscopic Fungi. While on the other hand, the ferments existing in the animal body, such, for instance, as those in the pancreatic fluid, or those constantly found associated with animal diseases, can hardly be looked upon as other than animal in their nature.

Dr. Frankland has boldly defined "a plant as an organism performing synthetical functions, that is to say, the building up or putting together simple materials into complex compounds; and an animal as an organism performing analytical functions, that is to say, the taking asunder more or less complex compounds, and resolving them into simpler compounds at the expense of potential energy;" and he considers that the micro-organisms associated with zymotic disease, and fermentive changes of similar character, are distinctly animal in their nature.

It is hardly necessary to say that this definition, as respects the bodies in question, is not accepted generally by biologists, and at the present time there is no accepted classification, and in reality it is a matter of no consequence. What we really want to know is the conditions under which such organisms are produced, and their life-history; and with the active and intelligent men now employed in this investigation, there is little fear of our being kept in the dark for any great length of time.

One of the most extraordinary features in the history of these organisms is, their persistent vitality under conditions most trying to life in the higher forms. The Bacteria produced in an infusion of fresh meat, for instance, have been exposed to the influence of gases such as hydrogen, carbonic acid, carbonic oxide, cyanogen, sulphurous acid, sulphuretted hydrogen, nitric oxide, &c., for many days at a time, and have continued in the most lively and, apparently, healthy condition. At the same time it has been found that certain other substances, such as carbolic acid, spongy iron,

permanganate of potash, chloroform, and strong alcohol, are speedily fatal to the same Bacteria which were able to resist the influence of the poisonous gases above mentioned. On the other hand, according to the experiments of MM. Gayon and Dupetit, reported to the Academy of Sciences in 1881, the microbe which they indentify as the one employed in the reduction of nitrates, not only tolerates strong solutions of carbolic and salicylic acids, but ferments them with as little concern as yeast ferments sugar. This shows that what may be food to one microbe is poison to another, and points out the idea which is strongly supported by other observations, that the varieties of organisms in existence are very specific and distinctive in their nature, and hence the study of their life-history is no very easy matter. One of their peculiar features is, that although it is easy to destroy the life of the actual working microbe, it is very difficult to destroy the vitality of the germ or spore from which they originate. These latter will resist the boiling heat of water for an indefinite time, as also the lowest known temperature. One thing certainly will destroy them, and that is, actual fire.

It has long been known that certain low forms of life are actively employed in the production of changes beneficial to higher forms of life, notably the part played by Diatomaceæ, Desmidiaceæ, etc., in oxidizing and purifying stagnant water; but Mr. Sorby, a most careful observer, has recently given some attention to the work accomplished by minute animals comprised under the head of Entomostraca, Rotifera, and the worm-like larvæ of insects. Mr. Sorby found that the number per gallon, and percentage relationship of these creatures, mark in a most clear manner changed conditions in the water of rivers such as the Thames; the discharge of a certain amount of sewage being indicated by an increase in the total number per gallon, or by an alteration in the relative numbers of the different kinds, or by both. It was proved that these organisms consumed excrementitious matter, and soon died without it. On the other hand, when the quantity of such impurity became excessive, they were

destroyed; probably because the natural oxygen of the water was totally excluded, and its place supplied by poisonous gases.

The number of the excrements of Entomostraca in the recent mud of the Thames is most surprising. In one specimen of mud from Hammersmith, Mr. Sorby found more than twenty thousand per grain, and the average number at Erith, in August, 1882, was above seven thousand, which is equivalent to about two hundred thousand per gallon of water at half ebb, from the surface to the bottom. This enormous number must represent a large amount of sewage material consumed as food. Mr. Sorby goes on to say that his observations lead him to the conclusion, that when the amount of sewage discharged into a river is not too great, it furnishes food for a vast number of animals which perform an important part in removing it. On the contrary, if the discharge be too great, it may be injurious to them, and thus the process of purification may cease. Possibly this explains why in certain cases a river, which is usually unobjectionable, may occasionally become offensive. The same authority then speculates as to whether these larger microscopic forms are capable of removing and destroying the still smaller germs, such as we are in the habit of associating with zymotic disease, and thinks it probable that such is not the case except incidentally; but suggests the probability that the more minute Infusoria do consume such germs as a portion of their food; and if so, we should be able to understand how living bodies, which could resist any chemical action likely to occur in a river, might be destroyed by the digestive process of minute animals or plants.

The number of suspended Diatoms, Desmids, and Algæ, per gallon of water is fairly astonishing. In the mud deposited from pure rivers they are comparatively few; but in districts where sewage is discharged, the number is vastly increased. For instance, Mr. Sorby found in the Thames as many as five millions per gallon of water; and concludes that their effect in oxygenating the water must be very important, since, when exposed to light, they would decompose carbonic acid, and give off oxygen under circumstances most favour-

able to animal life, and counteracting the putrefactive decomposition so soon set up by minute Fungi in the absence of oxygen.

This short resumé of the present state of our knowledge on the subject of micro-organisms is, however, only preliminary to one particular section of natural history which I desire to discuss more fully, that is to say, the Process of Nitrification which occurs in Soils. From very remote times we know of the existence and use of Nitrate of Potash, commonly called nitre, as being collected from the soil in hot climates, especially India and China. It is, as we all know, one of the chief ingredients in the manufacture of gunpowder; and whatever may have been the date of the discovery of this explosive in Europe, similar compositions were certainly known and used from a very early date by the Chinese. By far the largest part of the raw nitre now used in Europe for gunpowder, and other manufacturing purposes, comes still from the East Indies; and it may be interesting to mention how the production of it is managed, as described by Dr. Palmer of the Bengal Army. There is a caste of men known as Sorawallahs (*sora* meaning nitre), who make it their business to collect the raw material, manufacture the salt, and sell it either for freezing mixtures or for exportation. This Sorawallah goes about villages examining the small surface-drains, which issue from holes in the mud wall usually found around native dwellings and their cow houses. When he detects a faint white veil-like patch of crystals on the borders of these drains, he knows that a considerable quantity of this nitre exists on or near the surface of all the surrounding earth, and he therefore collects by scraping, a thin coating of this earth, and extracts the nitre by lixiviating it with water, and afterwards purifying the resulting salt by crystallization. The collector takes fresh portions from the same spots of ground from week to week, year to year, and from generation to generation, according to the manner of the Eastern world. The production of nitre is constant, so long as the place continues to be inhabited. It even continues to appear in large, but gradually decreasing, quantities, for years after the village is deserted.

Nitre is also found in the plains of India, being most abundant in the parts distant from mountain ranges. The soil is composed of a very uniform alluvium. For a depth of more than two hundred feet the uniformity of this is only broken by occasional thin layers of clay indicating former river-courses, and still more rarely by rough nodules made up of granules of carbonate of lime, so agglomerated that they enclose much of the surrounding sand, the proportion of carbonate of lime varying from fifteen to seventy per cent. These beds lie in a horizontal plane at depths varying from one to twenty feet. They are from six inches to three or four feet thick, from one to three yards wide, and from one to several miles in length, with occasional interruptions. The yield of nitre is abundant only where these calcareous beds exist in the soil, and where, at the same time, the natural water-level is from twenty to forty feet below the surface. In parts where the surface of the well-water is only a few feet from the level of the plain, no nitre is gathered: it is probably carried away and diffused as soon as formed. Where, on the other hand, the water-level is more than twenty feet from the surface, all the watery parts of fluids falling on the surface are drawn upwards and evaporated by the powerful sun, leaving the solid particles to be gathered or washed away when the new rain falls.

Thus much for the occurrence of natural nitre. But during the long European wars of the last and present century, saltpetre often became scarce and dear, and, moreover, being contraband of war, was difficult to procure. Necessity became the mother of invention, and hence chemists set their wits to work to obtain the material in other ways. It was found that when nitrogenous organic matters of various kinds were heaped together with calcareous substances, moistened and exposed to free air, that a continuous production of nitre occurred, which could from time to time be washed out, and the material being again left for a time, a fresh crop of nitre could be obtained, and so on time after time almost indefinitely. The occurrence of this so-called artificial nitre became an interesting subject of investigation to a number of leading scientific men, and

many experiments were undertaken in order to understand the true theory of the process.

Before describing any of these theories, however, I may say that the practice of making artificial nitre was largely carried on in France, Germany, Switzerland, and Sweden. In this latter country, indeed, a law was passed that every landed proprietor should be bound to supply a certain proportion of nitre according to the extent of his possessions. And in all cases it was found that the best conditions for the production of nitre were a loose porous earth containing lime, magnesia, potash, etc., the beds being mainly composed of old building rubbish, marl, morter, chalk, with a mixture of ordinary soil and decaying organic nitrogenous substances. The presence of moisture and a free current of air was absolutely necessary, and a temperature of not less than 60° or 70° Fahrenheit.

Glauber, one of the fathers in chemistry, laid it down as an axiom, that "saltpetre was formed by the decomposition of animal and vegetable substances." This theory was hotly contested by Lavoisier and Thouvenel. The former chemist found abundant evidence of the existence of nitrates in specimens of chalk from Roche Guyon and Mousseux. These specimens were taken from places a long way removed from all habitations, and from parts of the rock exposed to rain and all vicissitudes of the weather: and he came to the conclusion "that nitric acid does not pre-exist in this chalk, but is formed by the action of the air." The quantity of nitre which any specimen contained was found to depend most upon its vicinity to the surface. Thouvenel produced nitrates by exposing chalk to the gases evolved from the putrefaction of animal and vegetable substances mixed with common air; and he likewise obtained them when the same kind of chalk was in contact with nothing but atmospheric air. It is true he obtained nearly three times as much from the experiment in the presence of putrefying gaseous matter as he did from the alleged pure air: nevertheless he concludes: "It is demonstrated by these experiments that atmospheric air possesses all that is necessary to serve for nitrification as well as the air which emanates from putrescent bodies, provided it

finds matter capable of absorbing the materials." It is probable that in the state of chemical science of that day what was thought to be pure air was by no means such. Subsequently to these reports of Lavoisier and Thouvenel, another French chemist, Longchamp, proposed, as a theory, that it was due to the dissolved oxygen and nitrogen gases existing in water when mixed with calcareous substances that nitrates were produced; and Professor Graham, the late Master of the Mint, and one of the most valuable of our past men of research, endorses this view, but supplements it by the theory that free carbonic acid known to exist in all ordinary water played a very necessary part in the process. At the same time, Graham remarks that it cannot be denied that the nitrification of calcareous substances is greatly promoted by the contact or proximity of putrescent animal and vegetable matter, and the constant and universal practice in the formation of artificial nitre beds strongly confirms it. Professor Graham goes on to say: "I am disposed to attribute the beneficial effect in nitrification of the decomposition of animal and vegetable matter to the plentiful supply of an element which exists at all times in the atmosphere in perceptible quantity—carbonic acid gas. The free carbonic acid renders a portion of the carbonate of lime soluble in the water or moisture which must be present, and thereby enables the carbonate of lime to act more effectually upon the oxygen and nitrogen which the water has absorbed." In conclusion he says: "Should this theory of the instrumentality of carbonic acid in nitrification be eventually substantiated, several improvements in the artificial production of nitre might evidently be deduced from it."

This was the theory of nitrification up to a very recent date. It was well known that certain soils were especially productive of nitric acid; and it became a question of the highest interest to scientific agriculturists to ascertain the peculiar circumstances under which this important result was produced. The theory that the soil had power to absorb and appropriate a portion of the nitrogen of the atmosphere has been held, and is, perhaps, still held by some; but there is no proof of this, and the evidence is

entirely the opposite. The bodies yielding nitric acid in the soil are, firstly, the various nitrogenous organic substances which arise from the decay of vegetable and animal matter; and, secondly, the ammoniacal salts produced in the course of such decay, or from those contained in rain, or from such salts purposely applied as manure; and further, a trifling amount of nitric acid is found in rain water. "The production of nitric acid both from ammonia, and from the organic matter of arable soil, is shown by the field experiments at Rothamsted. The winter drainage water, from the various plots in the experimental Wheat-field, is found to contain nitrates nearly in proportion to the quantity of ammoniacal salts applied in the previous autumn; while the drainage water, rich in nitrates, which is obtained from soil unmanured for eight years, clearly derives the greater part of its nitric acid from the organic matter of the soil" (Warington, "Report on Nitrification," Journ. Chem. Soc. 1878, also Journ. Royal Agric. Soc. 1873).

In 1878 a report was laid before the French Academy of Sciences, by Schlösing and Müntz, proving in their opinion that nitrification was due to an organized ferment. This theory, they stated, was regarded as probable by Pasteur as early as 1862. Pasteur, in view of the active oxidation induced by Mycoderms in various kinds of organic matter, expressed the opinion that nitrification required to be studied over again from this point of view. It may be interesting here to note, that up to the time that Pasteur took up the study of fermentation, Liebig's theory had been in vogue; which was, that though ferments might be organic, nevertheless they were not organized, that they were nitrogenous substances undergoing change from active oxygen. It is, perhaps, needless to say that the views enunciated by Pasteur, and backed up by his marvellously conducted experiments, practically settled the question; and we all know what a wide field of evidence has since been exposed in the same direction.

The experiments of Schlösing and Müntz were, briefly, that of passing sewage which contains no nitrates, but a considerable amount of organic nitrogen and ammonia, through a column of

burnt sand and limestone, to ascertain whether humus or the organic matter of soil was necessary for the purification of sewage by soil. The sewage was passed through this pure mineral soil for twenty days quite unaltered; but at the end of that time nitrates began to appear, and rapidly increased, until the filtered sewage no longer contained any ammonia, but nitrates only. The experimenters put to themselves the question: If the change was simply a matter of oxidation, why did twenty days elapse before it occurred? If, on the other hand, the seeding and growth of germs was necessary before the soil could become effective, the reason of the delay in nitrifying is apparent. Now, one of the experimenters had proved beforehand that chloroform effectually suspends the action of organized ferments, while it has little or no action on soluble or chemical ferments. The vapour of chloroform was therefore allowed to pass through the filter, and immediately the formation of nitrates ceased. Nitrification had thus plainly been effected by some agent, the activity of which was destroyed by chloroform. The chloroform vapour was then removed, and the filtration of the sewage went on for some weeks, but no nitrification took place. The filtering material was then seeded with the washings of a rich garden soil in very small quantity, and the result was an immediate recurrence of nitrates, and the process went on as freely as before. The experimenters therefore conclude from this instance, and from other cases of rapid nitrification, that oxidation is produced through the action of a living organism.

Proceeding on these lines, a long series of most interesting experiments were commenced at the laboratory of the Rothamsted experimental farm, under the able supervision of Mr. Robert Warington, the results of which are published (On Nitrification: A Report of Experiments made in the Rothamsted Laboratory by Robert Warington).

Mr. Warington found that he could induce nitrification both in solutions containing ammonia, and in soils also containing it, both destitute of nitrates, by seeding them with a minute quantity of solution in which nitrification was known to be in progress, or from

soil known to be easily nitrifiable, such as the soil of a "fairy-ring;" that such nitrification could also be totally arrested by well-known antiseptics such as chloroform, bisulphide of carbon, carbolic acid, etc.; and he therefore concludes that the nitrification observed in soils and waters is due to the growth of a Mycoderm, and that the process is analogous to acetic fermentation in which alcohol is oxidized by the growth of the *Mycoderma aceti*. I need hardly say that these deductions are still disputed by some scientific men, and experiments have been made to prove that nitrification may take place by simple oxidation due to the oxygen of the air; but these experiments unfortunately have not been conducted with the care necessary to exclude atmospheric contaminations, which at once vitiate the evidence. The marvellously exact methods of Pasteur in removing all possible sources of uncertainty in dealing with such experimental evidence have not been followed, and hence no reliance can be placed upon the results.

In summing up the evidence as to the theory that nitrification is due to a living organism, I cannot do better than quote the words of Mr. Warington in his last report on the subject to the Chemical Society:—

"The evidence in favour of this theory of nitrification appears now to be very complete. Nitrification in soils and waters is found to be strictly limited to the range of temperature to which the vital activity of low organisms is confined. Nitrification is also dependent on the presence of plant-food suitable to organisms of low character. Further proof is afforded by the fact that antiseptics are fatal to nitrification. The action of heat is equally confirmatory. By raising sewage or soil to the temperature of boiling water, its nitrifying power is entirely destroyed. Finally, nitrification can be started in boiled sewage, or in other sterilised liquids of suitable composition, by the addition of a few particles of surface soil, or a few drops of a solution which has lately nitrified: while if no such addition is made, these liquids may be freely exposed to filtered air without nitrification taking place.

"It is difficult to conceive how the evidence in favour of the

ferment theory of nitrification could be further strengthened. Although, however, the greater part of this evidence has been before the scientific public for more than seven years, the theory that nitrification is due to an organism can hardly be said to have obtained any general acceptance; it has not, indeed, been seriously controverted, but neither has it been embraced. It is surely incumbent on those who discuss sanitary and agricultural questions either to accept the theory, and henceforth regard the oxidation of nitrogenous organic matter as effected solely by living organisms, and confined to the conditions suitable for their activity, or to adduce some evidence that nitrification may take place in soils and waters by simple contact with oxygen, when all organisms have been absolutely excluded. Schlösing has apparently given a final blow to the theory that air exists in a condensed state in the pores of a soil, and may on that account exert special oxidizing powers, by his recent experiments (Ann. de la Science Agronomique, 1884, 1), showing that the gases in a vegetable soil simply occupy the normal volume due to temperature and atmospheric pressure."

I will now come to the practical bearings of this subject upon soils and upon agriculture. It is abundantly evident that, the special organism which nitrifies ammonia exists in the surface soil of all fertile land, and Mr. Warington has elucidated the fact, that it is only in the surface soil that such an organism occurs. It was found that the nearer the soil was taken from the surface, the more rapid its nitrifying effects; and when samples were taken at a greater depth than nine inches, there was either no action whatever, or only a very feeble one, which took a long time to incubate. The distribution of Bacteria in soil has been microscopically investigated by Koch, and he states that the micro-organisms in the soils he has examined diminish rapidly with increasing depth, and at the depth of three feet the soil is nearly free from Bacteria.

Mr. Warington says: "Some important practical conclusions seem to follow from the limitation of the nitrifying organism to the upper soil. Thus it is evident that the oxidation of

nitrogenous matter in soil will be confined to matters near the surface; the nitrates found in the subsoil, or in the subsoil drainage waters, have really been produced on the surface, and have passed down by diffusion, or in a descending column of water. Again, in arranging a filter-bed for sewage, it is obvious that when dealing with a heavy soil lying in its natural state of consolidation, very little will be gained by making the filter-bed of considerable depth. If, on the other hand, an artificial bed is to be constructed, it is clearly the top soil, rich in oxidizing organisms, which should be exclusively employed."

There are some indispensable conditions to nitrification which I have not yet mentioned; namely, first, the presence of phosphoric acid, one of the essentials of organized life, thus fulfilling the German proverb: "Ohne phosphor kein leben." Another is the presence of lime, magnesia, or some salifiable base with which the nitric acid may combine. Wherever this condition was absent, it was found that the process of nitrification stopped. Another condition is a convenient temperature. The organisms appear either to die, or to lose their activity, at a very low temperature; unless very low, however, their action is revived with a rising temperature. Their point of greatest activity seems to be at from about 80° to 100° Fahrenheit: but at or near the boiling-point of water they are absolutely destroyed. Perfect drying, independent of temperature, also destroys them; but this condition of things never arises in a soil naturally. Altogether we are able to gather some valuable practical lessons in agricultural science from the study of these facts. It is evident that soils differ very materially in their state of fertility, and much of this must depend upon their nitrifying power. For instance, garden soil which has been frequently broken up and exposed to atmospheric influences, and liberally manured, is very rich in nitrifying power. On the other hand, cold clay soils, badly drained, and difficult to work, are very deficient in this capacity, as also are all soils in which there is a want of phosphoric acid or lime. It is evident that, in the present state of practical agriculture, these matters must receive

the most careful attention, if the pursuit of agriculture is to be made profitable.

It seems almost like a romance, but it is a fact, that the present frightful depression in the Wheat market is caused by the activity of this minute organism of which I have been speaking. The rich prairie soils of America are full of nitrates, accumulated throughout a long series of years, while they have been lying fallow at a convenient temperature, so that now it is only necessary to tickle them with the hoe or plough, and throw in the seed, to ensure a liberal return for many years. While here, on our hard-worked soils, exhausted by continuous cropping, and often rendered sterile by unfavourable seasons, the farmer has to put his hand into his pocket to buy ready-formed nitrates, or other nitrogenous materials, in order to get a crop.

In conclusion, it is somewhat unsatisfactory to have to state that the peculiar organism upon which the process of nitrification depends has not been clearly isolated, that is to say, the evidence is not irrefragable. It is true the two gentlemen previously mentioned by me, Messrs. Schlösing and Müntz, claim to have separated it, and have described it; but Mr. Warington states that the cultivations made by him, and examined by a practised microscopist, failed to show Bacilli; but they appeared to contain a Micro-coccus. On the other hand, Professor Ray Lankester states that the cultivations sent to him by Mr. Warington contained nothing else than Bacilli. The evidence, so far as England is concerned, is therefore not clear as to the actual identity of the organism; but investigations are still actively going on, and will no doubt in time lead to a more definite result.

I.

SAFFRON.

By O. Corder.

Read 28th October, 1884.

John Gerarde, a Master of Surgery, writing in 1579 says: "Saffron doth rise of the ground nakedly in September, and its long small grassy leaves shortly after the flowers; the root is small, round, and bulbous; the flower consisteth of six small bleu leaves, tending to purple, having in the middle several small yellow strings or threads [the stamens]; among which are three fat chines of a fiery colour, somewhat reddish, of a strong smell when they be dried, which doth stuff and trouble the head." He goes on to say: "Saffron groweth plentifully in Cambridgeshire, Saffron Walden, and other places thereabouts." He ascribes great and very powerful virtues to it, such as making the senses quick and lively, "shaketh off drowsiness and maketh a man merry, so much so, that if a man be at death's door, and almost past breathing, it bringeth breath again, and prolongeth life for certain days; it maketh also a man well coloured, and is most valuable to illuminate pictures and imagery, as also to colour divers meats and confections." Thus far says Gerarde. Now for a few minutes respecting its history and cultivation as set forth by modern pharmacologists; amongst whom, none stand higher than the late Daniel Hanbury of Plough Court, from whose voluminous papers I have taken these few notes.

Crocus sativus, or Saffron Crocus, is a small plant with a fleshy bulb-like corm and grassy leaves; it much resembles the common spring Purple Crocus of our gardens, but blossoming in the autumn. It has an elegant purple flower, with a large orange-red stigma; the three pendulous divisions of which are protruded beyond the perianth. The Saffron Crocus is supposed to be indigenous to

Greece, Asia Minor, and perhaps Persia; but it has been so long under cultivation in the East, that its primitive home is somewhat doubtful. Saffron, either as a medicine, condiment, perfume, or dye, has been highly prized by mankind from a very remote period, and has played an important part in the history of commerce. Under the Hebrew name *Carcom*, which is supposed to be the word for Crocus, the plant is alluded to by Solomon in the Canticles, as also by Homer, Hippocrates, Theocritus, Virgil, and others. The last-named speaks of the Saffron of Mount Tmolus, as also that of Coryca in Cilicia, and of Sicily, both of which localities are mentioned by Dioscorides and Pliny. Saffron was an article of traffic in the Red Sea in the first century, and the author of the Periplus states that it was exported from Egypt to Southern Arabia.

It was cultivated at Derbend and Ispahan in Persia in the tenth century, from whence it is not improbable that the plant was carried to China, for, according to the Chinese, it came thither from the country of the Mahomedans. Chinese writers have recorded that under the Yuen dynasty, from 1280 to 1368, it became the custom to mix *Sa fa lang* with food.

It is shown that Saffron was cultivated in Spain about the year 961; from thence it was introduced into Germany, France, and Italy about the time of the earlier crusades. About that period it was one of the productions of Cyprus, with which island France was then, through the Princess of Lasignan, particularly related. During the middle ages, and, indeed, up to the present time to a limited degree, it has been cultivated in Tuscany; its cultivation in Sicily has also been continued to our own times. The Saffron Crocus is said to have been introduced into England in the reign of Edward III., in 1327. Two centuries later, English Saffron was even exported to the Continent; for in a price list of the spices, etc., sold by the apothecaries in the north of France (1565), three sorts of Saffron are noted, of which Safren d'Angleterre is the most valuable. It was evidently produced in considerable quantities, for in 1682 we find in the tarif of the Apotheke of Ceele, in Hanover, *Crocus austriacus optimus* and *Crocus communis anglicus*. In the beginning of the last century (1723—28), the cultivation of Saffron was carried on in what is described by a contemporary writer as "all that large tract of ground that lies

between Saffron Walden and Cambridge, in a circle of about ten miles in diameter." The same writer remarks that Saffron was formerly grown in several English counties. Its cultivation, which was in full activity in 1594, had ceased in 1798 about Saffron Walden, and about Cambridge at the same date; yet its culture must have lingered in some few localities, for in the early part of the present century, a little English Saffron was still brought to London every year from Cambridgeshire, and sold as a choice drug to those who were willing to pay a very high price for it.

Saffron was employed in ancient times to a far greater extent than at the present day. It entered into all sorts of medicines, both internal and external; and was in common use as a colouring and flavouring ingredient in various dishes for the table. This drug, from its inevitable costliness, has been liable to sophistication from the earliest times: both Dioscorides and Pliny refer to the frauds practised on it. During the middle ages, the severest enactments were not only made, but were actually carried into effect, against those who were guilty of sophisticating Saffron, or even possessing the article in an adulterated state. Thus at Pisa, in 1305, the keepers of the public warehouses were required by oath and heavy penalties to denounce the owners of falsified Saffron consigned to their custody. The Pepperers of London, about the same date, were also held responsible to check any dishonest tampering with Saffron. In France, an edict of Henry II. (March 18th, 1550) recites the great advantages derived from the cultivation of Saffron in many parts of that kingdom, and enacts the burning of the drug when falsified, and corporal punishment for all offenders. The authorities in Germany were far more severe. A Saffron inspection was established in Nuremberg in 1441, and three years later, one Jobet Findeker was burnt alive with his adulterated drug. This adulteration still appeared to continue, for in the same city a few years later, one Hans Kohbeli, Lienhart Frey, and a woman were all buried alive for sophisticating Saffron. But enough of this part of our subject.

The flower of the Saffron Crocus has a long thin parted stigma, the upper portion of which is the officinal part, the lower being devoid of colouring matter, and contained in the tube of the perianth. The colouring matter is very remarkable: one grain,

rubbed with a little sugar, gives a distinct yellow tinge to ten gallons of water.

The flowers are gathered in September and October. About eight thousand blossoms are required to produce seventeen ounces of the fresh stigmas; and these waste greatly in the process of drying, so that only about three ounces of the dried Saffron is the result. Notwithstanding its high price, the cultivation is by no means always profitable, from the many difficulties attending it. Besides occasional injury from weather, the bulbs are frequently attacked by a parasitic Fungus which entirely destroys them. Indeed, I have found that it only blooms after a season like the present. Our present supply is mainly from Spain—from Alicante and Valentia. But in almost all countries its cultivation is on the decline, and in some, as our own, has altogether ceased. The imports in 1870 were about forty-four thousand pounds; but at present, only about half that quantity reaches us.

As a drug it has no medicinal value, and is only retained in our pharmacopœia solely on the ground of its utility as a colouring agent. A peculiar predilection still exists for it as a condiment, especially in Austria, Germany, and Switzerland. This predilection prevails even in England, especially in Devonshire and Cornwall, where the use of Saffron for colouring cakes, etc., is still common.

As a dye stuff it is but very seldom now employed, its use having been superseded by less costly substances.

Camden tells us that Saffron can only be profitably grown on the same soil for two years, then the land becomes exhausted for eighteen years. It would then be suitable for Saffron again.

II.

VARIETIES OF SUGAR, NATURAL AND ARTIFICIAL.

By F. Sutton, F.C.S., *President.*

Read 25th November, 1884.

It is probably no novelty to any here present to be told that there are several varieties of Sugar occurring in nature. Perhaps there is scarcely a plant or tree in existence which does not contain, or has not at some period of its existence contained, Sugar of some kind or other. I say at some period, because it is a fact, that many plants contain a notable quantity of Sugar in their earlier stages of growth, which disappears almost entirely as they ripen. This is the case with cereals, such as Wheat, and similar grain, and also with leguminous seed, such as Beans and Peas; young Peas, especially, are noticeable for the quantity of Sugar in them, compared with that which occurs when they are fully ripe. Fruit on the contrary increase in Sugar as they ripen.

Beet, Turnips, Carrots, Parsnips, and similar roots, contain Sugar in tolerably large proportion, especially if we take into account the large amount of water which they contain normally.

A special variety of Beet is the richest source of Sugar among this group, to which I will allude further on.

The two chief varieties of Sugar are:—

1. The ordinary constituent of the Sugar-cane (*Saccharum officinarum* and varieties), the White Beet (*Beta cicla*), the Sugar-maple (*Acer saccharinum*), the *Sorghum saccharatum*, known by some botanists as *Holcus saccharatus*. This latter belongs to the Gramineæ or Grasses, and it is the Sugar-cane of China, having been used there as a source of Sugar from the earliest times. The Cocoa-palm (*Cocos nucifera*), the *Borassus flabelliformis*, and *Caryota urens*, Palms growing in Ceylon. The Sago-palm (*Arenga saccharifera*), growing in the Moluccas; and the Plantain

and Banana of the West Indies. Beside these there is the Sugar-date (*Phœnix sylvestris*), known as the wild Date of Bengal.

Darwin in his 'Journal of Researches,' speaks of a Palm (*Jubæa spectabilis*) which abounds in central Chili, and yields a very sweet sap, which the natives make into a syrup, and call it *Miel de palma*, or Palm-honey. With his characteristic power of observation, he notices that when these trees are cut down in the early spring, and the crown of leaves is lopped off, the sap begins to flow from the upper end, and continues for several months; it is necessary, however, that a thin slice be shaved off that end every morning, so as to expose a fresh surface. A good-sized tree will yield as much as ninety gallons, and the whole of this liquid must have been contained in the vessels of the apparently dry trunk. The sap flows much more freely on those days when the sun is powerful; and moreover it is necessary to cut the tree down so that its upper end slopes upward on the side of the hill where it grows. If it lies the other way, scarcely any sap will flow, although in that case one would think that the action would be aided, rather than checked by the force of gravity. This movement of the fluid is no doubt due to osmotic force.

Now all the Sugars arising from the sources named, and hosts of similar sources, are precisely alike in constitution, and the Sugar is distinguished by chemists as Cane-Sugar, Saccharose, or Sucrose.

2. We now come to the second chief variety of Sugar, namely, that which constitutes the sweetness of ripe fruits, such as Grapes, Figs, Currants, and so on, also the sweet principle of honey. This kind of Sugar is known as Grape-Sugar, or Glucose. There is a true chemical difference between these two principal varieties of Sugar, and they can be readily distinguished from each other by specific chemical and optical tests. The remaining varieties are very numerous, but they are all distinguishable from the two chief kinds, and from each other. Among this class may be mentioned Maltose from malted grain, Sugar of Milk, Mannite, which is contained in the ordinary manna of the chemist's shop, Glycyrrhizine or Sugar of Licorice, and so on.

It must be remembered that the Sugars I have described are all of natural production; but there is at the present time, an enormous amount of energy developed in the artificial manufacture

of Sugar from substances which in themselves possess no natural sweetness.

I use the term enormous advisedly, inasmuch as there exist in the United States alone, factories capable of turning out as much as ten thousand tons per day of Sugar made entirely from the starch of Maize.

This artificial Sugar is all Glucose, and it can be made from almost any form of woody fibre, such as sawdust, straw, paper, linen or cotton rags; the best material, however, is undoubtedly the starch of some ordinary cereal plant. In the case of woody matter, such as sawdust, the resin of the wood is objectionable; but the natural starches are clean, and easily separated from the other constituents of grain, so that the conversion is easily done, and a good product obtained. Maize, or Indian Corn, being one of the best sources of starch, and a very productive crop in the States, is almost exclusively used for the purpose there. Potatoes contain large quantities of starch, and in some districts Potato-starch is largely converted into Sugar.

It has long been known that Sugar could be made from such materials; but it is only within the last ten or twelve years that the immense development has taken place in America. Maize is a prolific crop in the States, and can be obtained at a very low price, so low in fact, that notwithstanding the large cost of machinery and labour, Sugar can be made from it at one halfpenny per pound. We can hardly wonder, then, to hear of Cane-Sugar being sold retail at one penny per pound; for although Glucose cannot compete with Cane-Sugar in quality, sweetness, and general purity for domestic use, it can largely take its place for other purposes.

In 1880 it was stated that there were twenty factories in America, using altogether about forty thousand bushels of corn per day, and a factory was then building in Chicago which alone would use twenty-five thousand bushels per day.

In 1883 it was stated by a Government Commissioner, that the united factories in the States were then turning out as much as ten thousand tons of actual Sugar per day.

The process by which starch is turned into Sugar is very simple. It is merely heated for a certain time with dilute sulphuric acid; the acid is removed by adding lime, which precipitates the sulphuric acid as insoluble sulphate of lime, or gypsum; the clear

fluid is filtered away, and afterwards concentrated to a thick syrup, or dried completely into an opaque white mass.

Now the question arises, What becomes of all this artificial Sugar? It cannot be made to assume the beautiful crystalline appearance of Cane or Beet-Sugar; and though, undoubtedly, attempts are made to mix it off with Cane-Sugar as an adulterant, it cannot succeed to any great extent. It is, moreover, decidedly less sweet than Cane-Sugar to the taste, and unless very carefully prepared, possesses a flavour by no means as pleasant as genuine Cane-Sugar, leaving a bitterish taste in the mouth, and a peculiar mawkishness, which is very unlike pure Sugar.

Enormous quantities of it, however, are consumed in America in the form of table syrups, eaten with bread. The best of these, however, generally have a portion of real Cane-Sugar added, to increase the sweetness, and cover the defects of the manufactured article. Very large quantities are used in brewing, distilling, and vinegar-making, not only in America, but the material is also sent over to Europe for the same purposes, and it is largely used in England by brewers in addition to ordinary malt. If you ask me whether beer brewed with such a substance is as good, in my opinion, as genuine malt beer, I say, most decidedly, "No!" It answers some brewers' purposes to use it for beer which can be quickly made and consumed, and by customers who care less about the fine quality or flavour of the article than its alcoholic strength; but for real quality, there is nothing as yet equal to pure malt and hop.

This Grape-Sugar is also used very extensively for confectionery purposes, such as candies, chocolate, preserves, and for feeding Bees when it is not possible for them to get natural food.

But perhaps the most ingenious purpose to which it has been lately put by our cute Brother Jonathan, is the manufacture of artificial honey and honeycomb. Most of us have seen pretty glass jars of what looked like very select honeycomb immersed in clear golden honey. As a fact, the whole affair is "bosh." The honeycomb is made artificially of paraffin wax, and filled by the aid of a special machine with glucose, which has been artificially flavoured with flower-essences, so as to resemble the smell of honey.

It is probably known to most of us, that the Sugar industry is just now in a very depressed state, and the fault is laid very largely to the practice of Continental governments giving a bounty on

exported Sugar. The chief facts of the case are these, so far, at least, as Germany is concerned.

No considerable exportation of Beet-Sugar took place until after 1860: but in order to promote this exportation, the government refunded the taxes usually payable on its manufacture, and as the tax was levied by an assessment on each hundredweight of Beet used, and the drawback calculated according to the weight of Sugar to be exported, it happened that, gradually, and in an indirect manner, a premium was paid on exportation. The basis of calculation was, that twelve and a half hundredweights of Beet produced one hundredweight of Sugar. Now the tax on the weight of raw Beet comes to a little over nine shillings, and the drawback was fixed at nine shillings per hundredweight of Sugar: but the Sugar-makers soon found that by improving the cultivation of the root, and by improved methods of manufacture, they could get a larger yield of Sugar from a given weight of Beet; and the result for the last ten years has been such, that instead of twelve and a half hundredweights producing one hundredweight of Sugar, they can get that quantity from rather less than eleven hundredweights, and this drawback practically amounts to about a shilling a hundredweight on all the Sugar sent out of the country. No wonder then that the production of Beet-Sugar is very largely on the increase: and to show how great this increase has been, at the present time there are over half a million acres of land under Beet cultivation in Germany alone; that in 1872 two and a quarter millions of tons of Beet-roots were consumed, producing one hundred and eighty-six thousand tons of Sugar; while in 1882 there were nearly nine millions of tons of roots consumed, yielding eight hundred and thirty-five thousand tons of Sugar; and during the ten years' interval the importation of all kinds of Sugar into Germany fell from fifty thousand tons to six thousand tons, and the exportation rose from fourteen thousand tons to the enormous quantity of four hundred and seventy-two thousand tons. Meantime the quantity used for home consumption increased from twelve to eighteen pounds per head of the population. These figures apply to Germany alone, and beside these, there is a vast and increasing production in Russia, Austria, Hungary, France, and Belgium.

There are signs at the present time, however, that a period of over-production has arrived. The German government have now

reduced the drawback somewhat, but still leaving it to the advantage of the exporter. But we can clearly see that, with the immense production of artificial Sugar in America, and the great development of the Beet-Sugar industry on the Continent, the poor West Indian Cane-grower is between two fires, and is in great danger of going to the wall. Nevertheless he has great things in his favour. The Sugar-cane is undoubtedly the best source of Sugar: it is richer in yield by more than one half, and the plant entails far less trouble and risk to grow, while the raw Sugar produced is purer and cleaner than that derived from Beet. The molasses, or uncrystallizable Sugar, which result from Beet is so disagreeable in taste and smell, as to be unfit for human food; and unless the crystallized Sugar is prepared and refined with extreme care, it is not nearly so acceptable to the taste as Cane-Sugar. As to sweetness, it is commonly believed that there is a difference of from five to ten per cent. in favour of Cane-Sugar; but chemically, or optically, no difference can be detected. This is probably more a matter of taste than chemical analysis; but it is a fact that first-class jam-makers, and British-wine makers, will not knowingly use Beet-Sugar, however beautiful it may look, or cheap it may be.

The persevering and intelligent energy of the Beet-Sugar grower, who lives in a temperate climate, has, however, undoubtedly placed his hot-climate brother, the Cane-Sugar grower, in a bad place, notwithstanding his natural advantages; and until the latter can bring the same energy and inventive power to bear upon his production, there is little hope for improvement in his profits.

The growth of Sugar-Beet, and the manufacture, have been recommenced in our own Eastern Counties, but under considerable disadvantages for the moment. Whether it can ever be made of practical benefit to the farmer, time alone must show.

III.

THE EARTHQUAKE OF APRIL, 1884.

By Horace B. Woodward, F.G.S.

(Of the Geological Survey of England).

Read 25th November, 1884.

My short communication on Earthquakes and Subsidences in Norfolk (which appeared in the closing part of last volume) was followed, in less than a month after it was read, by a very alarming and serious earthquake, probably as severe as any which has taken place in this country during the present century. Originating in the neighbourhood of Colchester, this subterranean disturbance made itself felt over a wide area; and although its effects were especially disastrous in Essex, yet its dying efforts or ripples were felt over a considerable portion of Norfolk, at Lynn, Fakenham, Norwich, Diss, and Yarmouth.

Under such circumstances, a brief account of this earthquake comes legitimately within our records: and, as might have been expected, details of the damage done, and the experiences of various individuals, were not wanting in the newspapers and journals of the period.

The shock was felt at Colchester on the morning of Tuesday, April 22nd, at about eighteen minutes past nine o'clock. The air was sultry, the wind N.N.E., and the thermometer had risen. There was heard a rumbling under ground, accompanied (so some say) by reports or detonating sounds, a wave-like motion was felt, and three or four distinct shocks were experienced: but all was over in ten or twenty seconds, according to various accounts.

The results of this brief disturbance were, however, of a very destructive character in Colchester and the immediate neighbourhood. In the town itself it is stated that all the buildings were shaken, the spire (150 feet high) of the Lion Walk Congregational Church was brought to the ground, as well as many chimney-stacks, and the thoroughfares were strewn with bricks and tiles: while

southwards as far as Mersea Island, hardly a chimney-stack was left standing, and hundreds of houses were wholly or partially unroofed. The fine old church of St. Andrew, Langenhoe, was shattered, and almost destroyed; at Wivenhoe the church-steeple was overthrown, and the correspondent of the 'Standard' remarked that "the little village looked as though it had been bombarded."* Peldon and Abberton suffered likewise. In the former village every house appeared to be damaged more or less, and one house "was moved upon its foundation for a space of six inches, not laterally, but as if it had been taken and partially turned round."† Dr. J. E. Taylor refers to an instance of this kind, and states (on the authority of Mr. Wilkin of Wivenhoe) that there must at one spot have been a rise and fall of the ground of 2 feet 9 inches.‡ The evidence of a twisting motion, which has been frequently observed after earthquakes, was attributed by Mr. Mallet to "resolved motions, due to the transit rectilinearly of the shock."§ In the present case, this phenomenon has also been attributed to the second shock which many individuals experienced.

The trembling of the earth was likened by some persons to that produced by a traction engine or heavy vehicle passing along the road. To others the sensation was that of being at sea, with just enough motion to make it uncomfortable. People in some cases seemed to be lifted up, and they staggered, or even fell down; while in another case, an ass was prostrated, and its rider capsized. If the buildings vibrated, no wonder their contents were affected. Doors were opened or shut, bells were set ringing, the bedsteads rocked, plates rattled, pictures and ornaments were shaken, and gaseliers and pendants swayed too and fro. In a few instances chairs and basins were noticed to have a "gyrating movement;" many clocks were stopped, and a water-pipe burst. On the whole the disturbance was felt more in the upper rooms than in the basements of houses.

Other signs of commotion were observed. The water in ponds and pools was agitated or drained off. In one place a spring burst

* 'Standard,' April 23rd and 24th. (The date of all references to Newspapers is 1884.)

† 'Daily News,' April 24th.

‡ 'Nature,' May 8th.

§ See W. Topley, 'Nature,' May 15th.

up from the ground, while a few springs, previously clear, became cloudy and impure.

At Langenhoe several fissures were opened in the gravel walk at the Rectory; and in Mersea Island a crack was formed in the earth, extending for about three hundred yards due east and west.

Some atmospheric disturbances were noticed: there was a hail-storm at Diss, and a whirlwind near Tring.

The vibration produced by this earthquake, which seemed to have been developed under Mersea Island, was felt in all directions with decreasing force. At Ipswich, and throughout Suffolk, it was perceived, and Dr. J. E. Taylor has related his experiences in the county town.* At Sudbury, too, many persons were alarmed.

The shock extended as far as Cambridge, Ely, and Boston; to Northampton, Leicester, and Wolverhampton; and even as far as Stroud, Bristol, and Street in Somersetshire. It was felt near Reading, in and around London, at Ryde, Portsmouth, near Brighton, Hastings, Dover, at Rochester, and Westgate-on-Sea.†

Turning to our own county, we learn that the shock was experienced by several individuals in Norwich. Mr. G. B. Palmer, writing from Gorleston House, Great Yarmouth, says: "I perceptibly felt the shock about 9.20 yesterday morning. It caused the bells to ring in my house, and the servants came in answer to them; also the glasses on sideboard rattled together. I have also heard of several persons feeling it in Great Yarmouth."‡

"The shock was felt at Diss about twenty-five minutes past nine. Bells rang, houses were shaken, many persons believing the foundations of their dwellings were giving way."§

According to reports‖ the earthquake, though felt over the greater part of East Suffolk, was not noticed over the low land lying between Southwold and Halesworth.

Dr. Taylor stated¶ that the railway-cutting at Wivenhoe appears to have broken the continuity of the undulations, for the houses contiguous to it are comparatively uninjured: and in other parts of

* 'Nature,' April 24th.

† See Map by W. Topley, 'Nature,' May 15th.

‡ 'Daily News,' April 24th.

§ 'Eastern Daily Press,' April 23rd.

‖ 'Eastern Daily Press,' April 23rd.

¶ 'Nature,' May 8th.

the district chiefly affected, the stream valleys, according to Mr. G. H. Kinahan,* have exercised some influence in arresting or modifying the course of the earthquake-wave.

Dr. H. C. Sorby, who examined the area where the disturbances had been greatest, an area of about eight miles long by six broad, has referred to the irregular nature of the destruction wrought. He infers that the shock came up from below somewhat obliquely from south-east under East Mersea, where scarcely any damage has been done, and was most violent along the stroke of the wave at a distance of about three miles to the north-west. This, and the general character of the area of chief disturbance, point (in his opinion) to some very irregular distribution of hard rocks at a considerable distance below the surface.†

It was suggested by Mr. J. T. Ba'ton, of Northampton,‡ that the area affected by the earthquake was that beneath which the Palæozoic rocks occur comparatively near the surface in the south-east of England. This may of course be an area of subterranean disturbance, but it must be remembered these same rocks come to the surface in the western and midland counties (Charnwood Forest, etc.), and the area in question does not appear to be more subject to earthquakes than other portions of the British Isles.

As Dr. Taylor has pointed out,§ the disturbance was distinct in character from the shocks which precede or attend volcanic eruptions, and was probably of a kind which produced many of our faults, of which he instances examples in Suffolk and Essex.

Some have likened faults to the crackings of old furniture due to changes of temperature, and no doubt many of our disturbances are due to the drying, consolidation, and shrinkage of the rocks. Mallet, indeed, thought that volcanic action resulted from the heat induced during the contraction of the earth's mass: but his views are not generally accepted. Probably we shall not be far wrong if we attribute the recent earthquake in Essex to one or more subterranean rents produced by shrinkage, which led to no material shifting of the rocks, and which, owing to the tenacious nature of the subsoil at Colchester, chiefly London Clay, did not manifest itself in any conspicuous manner at the surface.

* 'Nature,' June 5th.

† 'Nature,' May 29th.

‡ 'Standard,' April 24th.

§ 'East Anglian Times,' April 23rd.

That this was not the case with the strata lower down seems evident from some interesting facts brought forward by Mr. C. E. De Rance. He remarked that the earthquake had produced a marked change in the level of underground waters in the district most affected by the shock. Thus at Colchester the water-supply is derived from a deep artesian well in the Chalk, the supply from which having lessened, the suction pipes had been lengthened. The necessity for still further lengthening them was under discussion, when the Water Committee were agreeably surprised to find that the earth-wave of the 22nd had caused an increased flow of water, and a rise in the water-level of seven feet. In a well at Bocking, near Braintree, after the earthquake, the water rose about twenty-five inches above its ordinary level. Mr. De Rance observed that these facts tend to show that the earth wave caused fissures to open in the Chalk, and thus permit a freer circulation of water under ground; for although Chalk absorbs water freely, it parts with it slowly, the water derived from chalk-wells being due more to water travelling in the joints and fissures, than to the water stored in the Chalk itself.*

It would be out of place here to enter into a discussion upon British Earthquakes. Those who wish to pursue the subject may consult Mr. Mallet's Catalogue :† and very likely some of the earthquakes not specially noted as being experienced in the county, may nevertheless have affected Norfolk. The earthquake of 1884 reminds us that a similar catastrophe might at any time overtake us; but the record of British earthquakes shows that disturbances causing so much destruction of property are exceptional in this country; and we can only trust that such may continue to be the case.

* 'Nature,' May 8th.

† Reports, Brit. Assoc. 1852—58 (reprinted 1858): see also 'London Magazine,' vol. xix. (1750) p. 102, and S. J. Mackie, 'Geologist,' vol. vi. p. 401.

Since this paper was read, two important articles on the Earthquake have been published. (1) "On some Geological Aspects of the East Anglian Earthquake of April 22nd, 1884," by Raphael Meldola, 'Proceedings of the Geologists' Association,' vol. ix. pp. 20—42, with map. Mr. Meldola promises to issue a fuller report. (2) "Notes on the Earthquake that took place in Essex on the morning of April 22nd, 1884," by G. H. Kinahan, 'Proceedings of the Royal Dublin Society,' vol. iv. pp. 318—325.

IV.

ORNITHOLOGICAL NOTES AT CLEY AND BLAKENEY, SEPTEMBER 3RD TO 19TH, 1884.

By F. D. Power.

Read 27th January, 1885.

Having, with my brother, G. E. Power, spent a fortnight's holiday, in the month of September, collecting at the above places, a record of the result, in many respects noteworthy, will, I feel sure, prove of interest to ornithologists generally, and more especially to those residing in Norfolk.

The first few days of our stay were wet and stormy; but the weather on the whole was extremely fine, with a remarkable prevalence of easterly and northerly winds. To these prevailing winds must be attributed the occurrence of so many species, for we observed no less than one hundred and nine; several of these being of irregular and uncertain appearance; whilst two, the Barred Warbler (*Sylvia nisoria*) and Icterine Warbler (*Hypolais icterina*), are so rare that these specimens represent, I am informed, the third examples of each obtained in Britain.

To Mr. J. H. Gurney, Jun., and Mr. H. E. Dresser, I am indebted for the names of such as I was puzzled with, or in doubt about; Mr. Dresser also having further interested himself in the matter, by exhibiting the *S. nisoria* and *H. icterina* at the meeting of the Zoological Society, on the 4th November.

With the exception of one day (the 5th September), on which there was a passage of Waders along the coast for a few hours, our most profitable collecting-ground was among the various patches of short cover on the north side of the harbour and at the foot of the sand-hills to the west. In this cover we noted the following species, named in order of abundance:—Blue-throated Warbler, Wheatear, Redstart, Whinchat, Meadow Pipit, Garden Warbler,

Tree Pipit, Common Whitethroat, Pied Flycatcher, Willow Wren, Lesser Whitethroat, Chiffchaff, Sedge Warbler, Wryneck, Black-headed Bunting, Thrush, Wren, Stonechat, Robin, Ring Ouzel, Spotted Flycatcher, Barred and Melodious Willow Warbler. Of the last four, but one each; but the Bluethroats, which head the list, must have numbered from eighty to one hundred.

Whilst resting, or delayed on the coast, for the two or three days the various batches of migrants stayed, they did not fare badly, as the ground at the foot of these shrubs swarmed with Flies, Beetles, Grasshoppers, etc., and as the well-filled gizzards of those examined testified.

Perhaps the most convenient method of conveying details of the above migratory movement will be by giving extracts from our daily jottings.

September 3rd. Wind light E. (W. the previous day). Weather fine. A small party of tame Knots about (reported to have remained all the summer). One Ruff and several Whimbrel observed. First Grey Wagtail seen. Immature Tree Sparrow, bird of the year, obtained along sea-wall. Several Meadow Pipits still making nesting notes, but no song. A solitary Spotted Flycatcher at the sandhills, the only summer migrant there.

September 4th. Wind N.E. and strong. Very wet; strong wind and stinging rain throughout. Obtained immature Richardson's Skua on beach in early morning. Turnstones plentiful, for once the commonest Wader. Many small migrants at the sand-hills, principally Garden Warblers, Redstarts, and Wheatears; but also two Wrynecks and some Greater Whitethroats. One immature Pied Flycatcher shot and another seen.

On this day, the Barred Warbler was obtained. It was solitary; in colour and flight not unlike a Spotted Flycatcher, and made no note. It is a female, and bird of the year. Length $7\frac{1}{16}$ in.; stretch of wings $9\frac{3}{4}$ in.; wing from flexure $3\frac{1}{2}$ in.; tarsus $1\frac{1}{16}$ in. Iris, dark brown. Upper mandible, horn colour, as also the lower, except the basal half, which was flesh-coloured. Top of head and back, greyish-brown; each feather on the back tipped with paler brown. Throat, neck, and breast, yellowish-white, inclining to buff on the flanks, on which appear some obscure transverse markings. Legs light greyish-blue, remarkably thick and strong: almost

Shrike-like in fact. This was exhibited, together with another immature bird obtained at Spurn, in Yorkshire, at the end of August, by Mr. Dresser, to the Zoological Society, November 4th. The species is moreover new to the Norfolk list.

September 5th. Wind W.N.W. and blowing fresh in early part of day. Rain often threatening, though none fell. From 5 to about 8.30 a.m. occurred the passage of Waders previously referred to, over beach and sea, going due west. Parties of Oystercatchers, Godwits, Redshanks, Sanderlings, and Dunlins, passed in tolerably quick succession. In addition to these, we observed two Little and one Temminck's Stint and five Dotterel: the latter passing in shot of both of us, left four in our possession. These were all in sober autumnal plumage, one alone showing some rufous on lower part of breast and flanks. Owing to accident, the bodies were not examined for sex. During the day, a flock of seventeen Sheldrakes seen, and an immature Greenshank obtained. Several Grey Plovers (the first seen) and perhaps a dozen Curlew Sandpipers noticed. A few Wheatears, one Redstart, one Tree Pipit, and one Sedge Warbler, were all that remained in the sand-hills cover of the innumerable migrants present the day before.

September 6th. Wind W. to S.W. (much rain). Fine early, blowing fresh from W.; this backed to S.W. as the day wore on, accompanied by driving rain until night. Birds very scarce. Two Bartail Godwits seen, and one obtained. Turnstones still numerous. A Cormorant flew in over the harbour, and four large Geese passed seawards. The carefully searched bushes only contained two Redstarts.

September 7th. S.W. gale and rain continued until noon; then with N. wind it cleared up. A solitary Swift passed south-east.

September 8th. Wind strong W.N.W., and fine throughout. A few Golden Plover and Knot passed west in early morning. An immature Black Tern shot on the beach and another seen. Curlew Sandpipers, Redshanks, and Turnstones, fairly numerous; but Dunlin and Ring Plover far from plentiful. In the scrub two or three Black-headed Buntings (the first noticed), many Meadow Pipits, and a solitary Bluethroat, which was wounded and lost. A Nightjar along seawall at dusk.

September 9th. Wind W. and driving rain greater part of day. A good many Razorbills within short distance of shore. Whimbrel,

rather many working west. Two Swifts hawking for flies on beach, amongst many Swallows and Sand Martins with a few House Martins. A party of twelve Teal seen, and a good many dark-looking Duck passing west, quarter to half mile at sea. The number of Larks and Meadow Pipits greatly augmented by fresh arrivals.

September 10th. Wind light S.E. Very fine. Birds scarce, and no migratory movement observable. A Peregrine seen over the marsh, and inland five Turtle Doves. Several parties of Greenshanks in twos and threes, moving about restlessly high up. **The last Lesser Tern seen this day.**

September 11th. Wind E. early, changing to N.N.E., and increasing in force as day advanced. Very fine. In early part of day a noteworthy scarcity of birds. Took a boat half a mile or so to sea, but observed only a few Razorbills and two or three parties of Black Duck going west. In afternoon, several Wheatears and a dark-looking Warbler (supposed Bluethroat) passed the boat going due south to the beach. On landing, we searched the banks towards Salthouse, finding, with the Wheatears just arrived, a good many Redstarts, and obtaining one Bluethroat. This proved the most advanced specimen obtained—a veritable *Cyanecula suecica*, showing the red spot fairly well. When dusk, I flushed a greenish Warbler out of a bed of Thistles, damaging it so much with large shot as to spoil it as a specimen: this was unfortunately the Icterine Warbler referred to above. Although very immature and much mutilated, thanks to Messrs. Gurney and Dresser it was identified, and shown at the Zoological Society at the same time as the Barred Warbler. This, also, is new to the Norfolk list. All the upper parts, including tail, were dingy green; under parts yellowish, brighter at the sides; iris, dark brown; base of lower mandible, yellowish; rest, horn colour; legs, bluish-grey. Length 5⅝ in.; stretch of wings 8¼ in.; wing from flexure 3⅛ in.; tarsus ⅞ in. Sex unascertainable. In general form and colour, the bird might pass for a large Willow or dingy Wood Warbler; but the shape of the bill, approaching in character that of the Reed Warbler, and the blue legs, would at once differentiate it from them.

September 12th. Wind E., turning to N. by noon, and becoming very gusty. Very fine. In the early morning, a few Bluethroats

along the east banks, and some even in the Sedge. Redstarts also numerous. Hawks in numbers; one Peregrine, several Merlins, and a doubtful Hobby, being noted: the latter, a small bluish Hawk, was observed systematically hunting along one of the reedy fleets, close to the top of the Reeds. A Temminck's Stint moving restlessly about, constantly uttering its queer cricket-like note. Among a flock of Linnets, which for some days past have haunted a green part of the beach, I noticed a larger bird with sharp note, not unlike the call-note of the Yellow-hammer. After some trouble it was secured, and found to be an Ortolan Bunting, a rare visitant to the county according to Mr. Gurney's 'Catalogue of Norfolk Birds.' It is immature—probably a bird of the year—and a male on dissection. In general appearance a miniature Corn Bunting, being of a sober brown colour, the feathers on the back darker in the centre, giving the bird a spotted appearance; under parts yellowish brown; breast spotted, and sides streaked with darker. Length $6\frac{3}{4}$ in.; stretch of wing $10\frac{5}{8}$ in.; tarsus $\frac{7}{8}$ in.

The day was passed at the sand-hills, and a most prolific haunt they proved. Bluethroats were present in extraordinary numbers, for we reckoned those seen at from eighty to one hundred. Redstarts, too, were abundant, and Whinchats and Common Whitethroats well represented; whilst Thrush and Common Wren appeared for the first time. We also obtained two immature Pied Flycatchers, and noted a solitary Wryneck. The Bluethroats we secured were immature, and males preponderated quite in the proportion of six to one. Of the eight skinned and examined by myself, only one was certainly a female; of the rest, five were males, leaving two doubtful (being badly shot), but believed to be male and female. There can, I think, be little doubt, but that these all belonged to the Arctic variety (*C. suecica*), although one only had the red spot well marked. Of the rest, four out of five possessed blue on the breast to some extent, and placed together, presented a pleasing variety of plumages. I should mention, that the certain female mentioned above, showed no blue on the breast; but at the same time, two at least ascertained males were also plain-breasted, so that this mark fails as a test of sex. The only note uttered by them was "Chack chack."

To-day, with the Warblers so abundant, the whole wading class was strangely scarce. At dusk, a large flight of Wigeon, seventy

to eighty, settled on a stubble near the coast, but escaped without salute.

September 13th. Wind E. and E.N.E. Fine. A few Knot arrived, a young Grey Plover shot, and more Ring Plover and Dunlin observed than heretofore. An Osprey appeared over the harbour, where it was mobbed by Black-headed Gulls; later in the day it was seen going inland due south, attended by a large flock of Starlings. Its flight much resembled that of a Heron,—for which, at the distance it was, I should have mistaken it, but for its attendants,—being carried on by slow steady flappings. An examination of the Bluethroats, and their companions, occupied us a large part of the day. We found all in greatly diminished numbers, although the Bluethroats numbered perhaps four dozen. First Rock Pipit and Stonechat observed.

September 15th. Very misty early, but a fine day. Wind E. (for the sixth consecutive day) throughout. Nothing about in the early morning; but in the forenoon, whilst crossing the "Marrams," my brother flushed a solitary Snipe, which, rising wild, flew straight at him! Bill remarkably short for size of bird, which, being sent off immediately, was not weighed or examined for sex. In the cover to-day found eight or ten Bluethroats, about the same number of Redstarts and Whinchats, one Pied Flycatcher, two Thrushes, a Robin, and a Tree Pipit. Razorbills numerous close in to the coast. Pied Wagtails numerous on the beach. Yellow Wagtails fast diminishing in numbers: only about a dozen seen to-day. A second Grey Wagtail observed.

September 16th. Wind S.E. and later N.E. A very fine day, but excessively hot. In early morning, a male Pintail, fast acquiring winter dress, bagged: it was one of five travelling east along the beach. An arrival of Snipe, singly and in pairs, moving restlessly about all the forenoon. Whilst working the "Scrub," we started a solitary Ring Ouzel, which was shot by my brother—a young male. Four or five Bluethroats, half-a-dozen Redstarts, a few Whinchats, and Common Whitethroats, three Pied Flycatchers, and a Chiffchaff noted. In the heat of the day Black-headed Gulls were hawking for flies, probably Craneflies, one hundred yards or more high. A few Wigeon down at dark, and one bagged. A last Nightjar seen at dusk.

September 17th. Wind N.E. Very fine and hot throughout.

Waders scarce, and Warblers nearly all gone on. A few Wheatears, two Tree Pipits, and a Redstart alone seen. Five or six Merlins about the beach; frequently watched in chase of Wheatears, which, however, invariably escaped. Larks and Swallows travelling south-east. On the marsh, a great arrival of Meadow Pipits. A bird with unknown note, not unlike the trill of the Snow Bunting, but shorter and louder, attracted attention as it rose from the sea-wall. It having alighted on a stubble, among a flock of Linnets, I followed up, and secured it by a long shot, as it rose wild. It turned out to be a Lapland Bunting—young male. In markings and colour extremely like a female Black-headed Bunting, but ruddier. Length $6\frac{1}{8}$ in.; stretch of wings $10\frac{3}{8}$ in.; from flexure $3\frac{1}{2}$ in.; tarsus $\frac{7}{16}$ in. Another was heard later in the day.

September 18th. Misty early, with light N.E. wind. A few Redthroated Divers fishing along the coast, but very little about. One Whimbrel and two Common Terns noticed. The small summer migrants represented by eight or ten Wheatears and three Yellow Wagtails.

September 19th. Out for an hour only. One Common Tern seen, and many Razorbills fishing tamely within shot of beach. Swallows and Martins still fairly numerous. Three Wheatears and one Yellow Wagtail observed. A Reed Warbler heard singing subduedly in one of the reedy fleets.

From the foregoing particulars, it may, I think, be safely assumed: First, That flocks of Scandinavian (?) Migrant Warblers only touch our coast with a north or north-east wind,—clearly was this the case on the 4th and 11th. Secondly, That with wind at all from the west, they move on at once; also plainly shown in the sudden disappearance of the mixed multitude on the 4th, after only one day's stay. The very few seen between the 5th and 11th may have been weakly birds; which, if still on the move, only changed ground from another part of the coast. From the 12th to 18th, the last day we visited the sand-hills, the wind continued between north and east throughout; and it will be observed how very gradual was the disappearance of the large flight which arrived on the 11th and 12th. With a west or south-west wind during those days, there would, I believe, have been a speedy clearance of the whole lot.

It is probable that these small migrants, when not provided with suitable cover, are always working gradually eastward; for we found it impossible to drive Redstarts westward along the bare sea-wall: they invariably flew round and back. If, however, we were walking east, they readily flitted on in front.

One final remark. The heavy rains, following on the long drought, by bringing worms and insects to the surface, rendered the marsh pastures a highly attractive feeding-ground to the Black-headed Gulls and Curlews. These almost entirely forsook the harbour, and in one large congregation fed and rested day after day in the centre of the largest marsh, secure and free from interruption.

[If there happen to be a strong wind when there are Sandpipers and other birds on the mudflats or on the shore, they cannot feed, and the only alternative they have, is to fly against it. If this be a west wind, which in the autumn is most prevalent on our coast, or a north wind, there is presented to us the anomaly of migratory birds going northwards (or rather westwards, at Blakeney, where the coast curves) at a time of the year when the migratory instinct ought to carry them in the opposite direction. Of course a return movement must follow when the wind has dropped, but this is very likely not noticed: but the unusual movement northwards or westwards will be noticed, though the direction of the wind is not always remarked. The movements of all birds which feed where there is no cover, such as trees or herbage, are very dependent upon wind. This is particularly the case with Gulls and all shore-birds: and the anomalous northward movements alluded to, are all to be accounted for by this simple cause. They cannot, or will not, fly with the wind, they cannot remain and feed where they are,—they therefore fly against it. In doing so, they are really going in a wrong direction,—to be made good afterwards, not necessarily directly the wind drops, but at no very distant date.

Readers of Mr. Power's interesting Notes for 1880 and 1881 (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 345) will remember that a migration occurred in both those years, almost exactly similar to that here recorded, only lasting several days, the wind continuing north, and very strong. No doubt the extent of this backward movement was far beyond Blakeney. It was noticed at Spurn in Yorkshire, by Major P. K. Seddon and Mr. W. E. Clarke (Yarrell, 'British Birds,' vol. iii. p. 274). If there had been any observer on the look-out at Yarmouth, Aldborough, or Harwich, or any similar place on the east coast, it could hardly have failed to be noticed there also, for I am quite sure that movements of this kind are very extended.—J. H. Gurney, Jun.]

V.

ON A HIGHLY FERRUGINOUS WATER FROM A WELL AT KIRBY BEDON, NEAR NORWICH.

By F. Sutton, F.C.S., *President*.

Read 27th January, 1885.

In June, 1884, Mr. John Gunn, the President of the Norfolk and Norwich Geological Society, called my attention to a well newly sunk by Mr. Coaks, at Kirby Bedon, the water of which showed some features rather uncommon in this district. It was alleged that the water was of much higher temperature when fresh drawn than the surrounding atmosphere; and, moreover, that it was both undrinkable, and possessed such peculiar characters in other respects, as to render it entirely unfit for general domestic use. When attempts were made to wash either the hands or anything else with it, it was found that instead of tending to cleanse away dirt, quite an opposite effect was produced, and everything was stained and made more dirty by its presence. On attempting to use soap with it, the evil nature of the water was rendered even more apparent, for it rapidly decomposed the soap, setting free the fatty acids into a dirty greasy scum. When boiled it turned completely black, and deposited a dirty greenish-black mud, which, by exposure to the air, turned of a brick-red colour, leaving a great amount of stain and incrustation upon all the vessels in which it was placed. Being myself familiar with the waters contained in rivers, lakes, and wells of the Eastern Counties from many hundreds of analyses made in the course of the past twenty years, and knowing of no specimens which exhibited such very marked features as were credited to this particular well, I arranged to pay a visit to it in company with Mr. Gunn, the late Mr. Orfeur, and Mr. Dix, and a day was appointed for the purpose. When the time came, however,

I was prevented from joining the party; but the other members went, and brought me a sample drawn in their presence from the well, and placed in a glass-stoppered bottle provided by me for the purpose. The visitors described to me the peculiarities of the water already alluded to, with other details obtained from the persons living in the cottages, and I believe also from Mr. Fake, who assisted in excavating the well. I have not myself seen the well-sinker, so as to ascertain the exact depth of the well, or the nature of the strata through which it is dug. I believe, however, that it is somewhere about one hundred feet deep.*

On the 12th of December, 1884, I went over to Kirby Bedon for the purpose of taking another sample, in order to see whether, during the lapse of six months, any alteration had taken place in the composition of the water. I then saw the wife of the keeper who lives in one of the cottages, and she drew me a bucket full of the water, from which I bottled a portion for analysis.

The well is built in a substantial manner, and is furnished with ascending and descending buckets, fitted with chain, and worked by a flywheel turned by hand. I saw that the buckets and chains were heavily incrusted with oxide of iron; and the keeper's wife told me that the water had been from the first, and was still, quite useless for any domestic purpose, and that they had to send to another well some hundreds of yards away for all their water.

Before proceeding to describe the peculiarities of this water, it will be perhaps advisable to explain briefly, and in common language, the general nature of underground waters, and of this district in particular.

Well or spring water, as it is commonly called, is really rain water which has fallen from time to time upon the surface of the land in a tolerably pure state. If it could be collected apart from the impure air through which it ordinarily passes, or the still more impure roofs of buildings off which it runs, it would be practically pure; that is to say, it would be free from organic bodies, such as organic dust, soot, ammonia, or an oxidized form of ammonia, nitric acid; it would moreover be completely free from mineral

* I have since been informed that the depth of the well is one hundred and ten feet, with the following sections: first twenty feet from surface grey clay, next sixty feet blue clay, then twenty-five feet of bright sand, followed by four feet of iron-pan, and the last foot is mixed sand and blue clay.

substances, such as salts of lime, magnesia, iron, etc. Collected as it generally is, it is practically free from these latter bodies; and however much it may be contaminated with the impurities of the air, it is still "soft" water, that is to say, free from mineral impurity. When, however, such water falls upon the earth, it sinks into it, and filters down through sands, gravels, and crevices, till it finds the level of the water already stored up in the earth. The power which rain water possesses of dissolving earthy substances is very great; but this power is very much increased after it gets into the ground by the absorption of carbonic acid gas under pressure. For instance, pure rain, or what is the same thing, distilled water, will not dissolve chalk to the extent of one grain in a gallon; but when charged with carbonic acid gas, such water can be made to dissolve as much as fifty or more grains in the gallon. Such a water will also dissolve the hardest flint, and other bodies, which are only usually attacked by the strongest mineral acids. This carbonic acid gas exists very largely in the interstices of the ground, especially in all the newer geological formations, and arises mainly from the oxidation of organic matters, such as animal and vegetable tissues, wood, leaves, roots, and so on; beside which an enormous quantity is carried into the ground by rain water, which collects it from the atmosphere, in which it constantly exists to an average extent of four parts in every thousand.

Of course there is less of this gas in the districts of the primary rocks, and the nature of these rocks is such that very little carbonaceous matter exists in them to form carbonic acid; but even here there is some, and consequently the waters derived from such rocks will contain some dissolved mineral matters arising from them.

In Norfolk, as we know, Chalk is very prevalent, not only in regular deposit, but also mixed up with gravels, sands, and clays, all over the county; consequently this substance is the chief dissolved mineral matter in Norfolk waters; and the quantity of it dissolved in springs varies from five to ten grains per gallon in sands and gravels, to thirty or forty grains in the regular Chalk formation. This Chalk, or carbonate of lime, is invariably accompanied by small quantities of magnesia, also in the form of carbonate; and so constant is it, that it must be assumed as a fact that all the Chalk formation contains small quantities, say about three or four per cent. of magnesia. The Chalk also contains small quantities of

sulphate of lime, or gypsum, seldom more than four or five per cent., so that Norfolk waters will always show the presence of these two substances. There are also always traces of iron and alumina from clays, and of silica from flint or clay, which latter is simply a silicate of alumina. The magnesia is derived no doubt from the decomposition of minerals existing as silicates of magnesia. The gypsum, or sulphate of lime, may either have been derived from similar sources, or, more probably, from oxidized sulphur in organic bodies or iron pyrites.

The average composition of waters derived from the Chalk will be as follows; that is to say, supposing them to be uncontaminated with various surface impurities, such as sewage or surface drainage:—

Carbonate of lime, or chalk . .	10 to 15	grains	per gallon.
Carbonate of magnesia . . .	2 „ 3	„	„
Sulphate of lime	3 „ 4	„	„
Chloride of sodium, or common salt .	3 „ 4	„	„
Oxide of iron, alumina, and silica .	1 „ 3	„	„
Total solid matters varying from .	19 to 29	„	„

There are occasionally to be met with, waters out of the drift clays near the coast, such as Cromer, Yarmouth, Lowestoft, etc., which contain larger quantities of these mineral salts, and especially common salt, but it is very rarely that the total solid constituents amount to as much as one hundred grains in the gallon.

Before describing the details of analysis of this Kirby water, I would just say, that I think it better to simply give the constituents in an uncombined state; and, indeed, this is now very properly the usual way of stating the analysis of water. Formerly, the attempt was made to allot the acids and bases according to the laws of chemical affinity; and, in the case of the average Chalk water given above, I dare say we cannot go far wrong in believing that the carbonic acid is combined with the lime and magnesia, that the sulphuric acid is combined with a portion of the lime, and that the chlorine is united to the sodium as common salt. But with the water under discussion, the dissolved solids are so exceptional in their nature and quantity, that it is difficult to guess how they are combined.

When first drawn from the well the water is quite clear, and I

was told by the keeper's wife, that it had sometimes come up quite warm, and even gave off a steam when exposed to the cold air. I have no doubt this is quite true, as the chemical action going on with such materials would certainly produce a high temperature. After exposure to the air for an hour or two the water becomes opaque, and deposits a bright red precipitate of oxide of iron,—practically the same thing as iron rust.

I now give the figures of analysis for the two samples, one taken in June, and the other in December, 1884, and append also the proportions of iron found in other natural springs in various parts of the world :—

Analysis of Kirby Bedon Water.—Grains per gallon.

	June, 1884.	Dec., 1884.
Oxide of iron	42.24	17.50
Lime	60.20	62.86
Magnesia	23.71	17.64
Sulphuric acid	155.68	133.70
Chlorine	29.40	27.50
Carbonic acid and alkalies, with some alumina and silica	53.20	48.80
	364.43	308.00

Traces of ammonia and potash ; no phosphoric acid, nitric acid, or heavy metals.

Quantities of Oxide of Iron in other Natural Ferruginous Waters.

British.		Foreign.	
Bath	.189	Bourbon, France	17.99
Tunbridge Wells	2.66	Vichy, France	9.66
Harrogate	2.87	Carlsbad, Sprudel	.154
Isle of Wight (aluminous chalybeate)	103.5	Spa, Sprudel	5.22
Holywell, Lancashire	1.67	Pyrmont	4.27
Hartfell Spa, near Moffat, Scotland	5.77	Kissingen	3.11
		Selters Wasser	.868
		Ballstown, New York State	22.61

These enormous quantities of iron, magnesia, and sulphuric acid, in the Kirby water, are positively startling. If it had been the drainage water from an iron mine, one could understand it ; but to

find such a water in the heart of the Chalk district is decidedly a novelty, and moreover they are just those things which are found least in the ordinary Norfolk waters.

The origin of the iron and sulphuric acid is doubtless iron pyrites, which consists of about equal weights of iron and sulphur. This substance is known to exist occasionally in the clays and marls of this district, and is often found to be the petrifying agent of animal and vegetable remains. When this substance is exposed to the combined action of water and air, it is rapidly oxidized to sulphate of iron, commonly known as green copperas - a salt which is soluble in water. If this solution is in turn brought into contact with chalk, a double decomposition takes place, and the chalk, which is carbonate of lime, gives up its carbonic acid to the iron, and unites itself with the sulphuric acid, and thus we have sulphate of lime and carbonate of iron. That the iron does exist mainly as carbonate in this water is evident from the fact, that the water is quite clear when first drawn, but soon begins to deposit on exposure to air or by boiling; the explanation of this being, that free carbonic acid gas is largely present in the water, and keeps the iron dissolved. When, on the other hand, this gas is driven off either by mere exposure or by boiling, the iron is no longer soluble, and falls down as a precipitate of red oxide.

The presence, therefore, of the iron and sulphuric acid is accounted for; but I must confess I am puzzled with respect to the magnesia. I can only imagine that there must be a boulder of dolomite or magnesian limestone in contact with the iron pyrites, or within the immediate neighbourhood. Or another hypothesis may be allowed, namely, that the well is sunk into an old sea-bed, the salts of which are largely composed of magnesia, and from some protecting cause have not been washed out of the soil by diffusion among the surrounding ground-waters. This view is much favoured by the abnormal quantity of chlorine.

If I may venture an opinion trenching somewhat on the domain of the geologist, I should say that this well has been sunk into a pocket, or fissure, surrounded by some impermeable, or at least not easily permeable, material such as clay, in which these concentrated chemical substances have been stored up for ages, but that the opening of this well has disturbed the strata, admitting air and water,

two very powerful agents of decomposition, and hence the present state of affairs.

The change which has already taken place between the nature of the water as first examined, and after a lapse of six months, shows that the peculiar constituents are diminishing, although I do not suppose the water has been much used. The probability is, however, that the peculiarities will go on diminishing whether the water is drawn away or not; but whether it will ever be a well adapted for domestic use, time alone can show.

VI.

NOTES ON A NEST OF THE COMMON WASP (*VESPA VULGARIS*).

By J. B. Bridgman, F.L.S.

Read 28th February, 1885.

Mr. Gurney Buxton kindly gave me a large nest of *Vespa vulgaris*, one of our commonest British Wasps, which he took at Catton. On removing the scaly covering, I found between this and the lower layer of cells, what I should imagine was the whole colony of workers with a few males. These were huddled together in large masses in every available space between the scales, and not a few were head downwards in the lower cells. They had evidently been killed by the cold. Many had their stings projecting. They had been dead but very few days, as the bulk of them were far from dry. There being no mould is a proof they were not limp from damp. They were so fresh, that I pinned some of the males for my collection. Amongst all this number there was not one of the fully developed females, commonly called Queens. Instinct had prompted these to seek some warmer hybernaculum in which to pass the winter, before the cold set in sufficient to kill the other two sexes. It seems strange that instinct should direct

one sex to save itself from the cold, and leave the other sexes to perish as they always do. The males and workers never survive the winter. The nest consisted of five complete layers and two incomplete ones. The five complete were the upper ones, and consisted almost entirely of worker cells. Towards the outside were a few larger cells, which most probably contained some of the males. The fourth and fifth layers were the largest, an irregular oval in shape, and about nine and a half inches in diameter. I had not patience to count the cells, but found that a square inch contained about twenty-five worker cells. By measuring I came to the conclusion that the largest layer contained about sixty-four square inches. This would give about one thousand six hundred cells to that layer. And at a rough guess I should say that altogether there would be about five times that number, which would bring it to eight thousand cells in all; and as the worker cells are said sometimes to cradle more than one brood, sometimes as many as three, and supposing there to have been one thousand cells for male and female, which I believe to be too many, and each of the others to have been used three times, this would give twenty-one thousand. But many, most probably, did not serve more than once so that the colony would not reach to quite these figures. But at any rate the number must have been large. The sixth layer consisted of three irregular ovate masses of female cells, which are the largest of the three kinds; and the seventh layer was composed of six masses of different sizes of the same kind of cells. Two of these masses were attached to each one of the sixth layer. This nest had been commenced by the parent female in the spring, and had been built downwards and outwards. The female makes at first a few cells from which workers are reared, and these assist in forming new cells and feeding the larvæ; and as all Wasp grubs are fed on insects or spiders, one can imagine the destruction of life caused by the inhabitants of so large a colony as this. It is very interesting to watch a Wasp when she has caught a fly; she rears herself up on her hind legs, holding the fly with the front pair, twists it round very rapidly, cutting off the legs and wings as useless incumbrances. One curious habit I have noticed in the position of hybernating Wasps: it is, that they fold their wings along the underneath part of their bodies, covering up the legs, instead of over the back, as they do when at rest or at other times. I have

never seen Wasps in this position except when hybernating. Wasps are subject to the attacks of several insects. One small Ichneumon (*Sphecophaga vesparum*) is produced from larvæ which feed on the living Wasp grub. Chrysis, the lovely ruby-tailed fly, also is reared at the expense of the grubs. So also are several flies; and besides these at least, one Beetle and one Moth live in Wasps' nests.

There are seven species of Social Wasps natives of Great Britain, and of these six are found in Norfolk,—this number includes the Hornet,—and all are fairly common except one.

VII.

A COMPARISON OF ORNITHOLOGICAL MIGRATIONS IN ENGLAND AND HELIGOLAND.

By J. H. Gurney, Jun., F.Z.S.

Read 24th February, 1885.

Of all subjects connected with Ornithology, there is none so interesting, and none so difficult to comprehend, as Migration. The periodical return and departure of a vast number of Birds to and from their breeding-quarters has long been marked by a host of field naturalists. If all which has been written upon it were collected, the volume would be huge indeed. Inferences have been drawn, comments have been made, and a good deal has been learnt about it! but the matter still remains a wide field for speculation in many ways, though our knowledge is far in advance of what Selby, Montagu, Gilbert White, and the continental naturalists of their time possessed.

Migration is a subject, the antiquity of which is immense. It was familiar to the Prophet Jeremiah, who enumerates four species, the Stork, the Crane, the Swallow, and the Turtle Dove, which knew and observed the time of their coming. It is almost as old

as any literature which is extant.* Why then are we still so ignorant about it? I think any one who fairly considers the subject will admit that one of the chief reasons is, because the mass of facts which are recorded in our Natural History journals have never been properly tabulated, or rather, I should say, no attempt has ever been made to tabulate them in any way. Let me merely refer to the 'Zoologist' and to the 'Field' newspaper, containing a multitude of observations, and the "Reports on the Migration of Birds" now annually published, as exemplifying what I mean.

Although it may seem like shirking the question to call it instinct, science can as yet give no better solution to the mystery of migration.

The theory of migration by sight is open to many objections. Perhaps it is intended that we never should unravel the mighty mystery. Enough for us to say with the author of the Book of Job, "Doth the Hawk fly by thy wisdom, and stretch her wings towards the south?" (Job xxxix. 26), and leave it in His hands, Who gave to each animal the attributes proper to its nature.

On fine starlight nights migratory birds fly high, but if dark and misty they are taken at lighthouses, and this circumstance is in favour of migration by sight. More birds than we think for migrate by day. As corroborative evidence, we may remember the extraordinary acuteness of vision of the Vulture and Peregrine Falcon in discerning their prey. Again, there is the opinion which generally obtains on the subject in the case of Pigeons: for experts consider that the Homing Carrier is undoubtedly guided by sight, coupled with memory of prominent objects it has seen before. It will be readily admitted that numerous instances prove the vision of birds to be more acute than the most perfect human vision. On the other hand the opponents of this theory of sight say: "How can birds find their way over oceans and seas? How, for example, can the Grey Crow, the Woodcock, and the Goldcrest, find the right path over the North Sea?" Sight would be of no avail here, even granting birds the most extraordinary powers, exceeding a hundredfold that of human beings. That birds are hatched with a migratory instinct is proved by the efforts of captives to get out of their cages, which efforts generally cease when the usual period

* A list of the ancient classics, in which the subject is alluded to, will be found in Forster's 'Observations on the Natural History of Swallows' (p. 51).

of migration is past. Probably also they have an instinctive knowledge that they must go south in autumn for their food supply; but they cannot really have much idea of the direction in which to go when they are out at sea. Practically it comes to this, that all birds in crossing seas must fly against the wind, crossing, it may be, some great expanse from one side to the other,—with a tendency to go south, and therefore pursuing coast-lines when the wind allows them, in that direction.

With this proviso, there are many ornithologists who would acknowledge themselves believers in the theory of migration by sight: but the whole subject is beset with difficulty.

If in September or October the wind suddenly changes, and blows hard from the N. or N.W., a rapid retrograde movement of shorebirds at once takes place on the east coast. I have noticed this on three or four occasions, though it seems to have entirely escaped the attention of several observers. Of course it is followed by a return movement, perhaps made at night, and so not noticed.

The great factors in producing migration are *food* and *the direction of the wind*. Birds migrate for want of food in the autumn, and in spring they migrate to a latitude where suitable food will be found for their young ones. They move on fast or slow according to the varying direction of the wind; for they always have to move against it, if there is any; though it may be granted that birds, particularly small ones, prefer a day when there is no wind at all for migration.

The state of the temperature has probably nothing whatever to do with these movements. Birds can bear a great amount of heat or cold with perfect equanimity; and it is a great mistake to suppose that they leave northern regions to get away from the cold, against which their feathers, which can be contracted at will into a tight-fitting covering, or expanded for flight and preening, are an ample protection.

The following is an attempt to draw up, for the information of ornithologists who are interested in migration, a comparative table of all the instances of a specially marked simultaneous migration of the same species of bird to the east coast of England, and to Heligoland, that little island in the North Sea, so famous for the extraordinary number of rare birds which have occurred upon it.

as well as for the enormous numbers in which commoner species often pass it.

My statistics for Heligoland have been chiefly taken from the "Migration Reports" and the 'Zoologist,' to which they have been communicated by Herr Gätke, through Mr. John Cordeaux. Herr Gätke, who has taken a great interest in the matter, was so good as to verify some of them, and make a few slight corrections and additions from his journals, going back as far as 1866, when I had the pleasure of making his acquaintance, and being shown his marvellous collection, in the rocky island where he lives.

The statistics for England have been collected from 'The Zoologist,' or from the "Migration Reports" published under the auspices of The British Association. And, here again, I am greatly indebted to the pen of Mr. Cordeaux, who has kept up a continuous register for Lincolnshire and part of Yorkshire, and to Mr. Henry Stevenson, who has done the same for Norfolk.*

Island of Heligoland.	East Coast of England.
1866. 1867.	
Herr Gätke does not note any migrations of birds in large numbers in 1866 and 1867. [He however notes the Yellow-browed Warbler (*Phylloscopus superciliosus*) in September and October, 1867,—the latter being the month in which one is said to have been obtained at Cheltenham in England. It is a species which has occurred many times in Heligoland. The appearance of the Red-necked Grebe (*Podiceps rubricollis*) in numbers on our East Coast in 1865 had no counterpart in Heligoland.]	
1868.	1868.
In August and September, Crossbills (*Loxia curvirostra*) in great abundance.	In the summer and autumn, many Crossbills.

* An interesting paper on the most remarkable migrations in England, in each year, from 1863 to 1876, by Mr. J. Cordeaux, appeared in 'The Field' of March 11th, 1876, continued March 18th. It would be of much value if reprinted, and brought up to date.

Island of Heligoland.	East Coast of England.
1868.	1868.
September to end of October, Richard's Pipit (*Anthus ricardi*) up to fifty daily.	[During the autumn, eight Richard's Pipits were taken on the south coast of England, but, apparently none on the east coast.]
October and November, hundreds of Storm Petrels (*Procellaria pelagica*).	In November several Storm Petrels in Norfolk.
[During the autumn?] more Greater Spotted Woodpeckers (*Picus major*) than usual.	During the autumn twenty-nine Greater Spotted Woodpeckers were obtained in Norfolk (H. Stevenson).
1869.	1869.
October and November, hundreds of Shorelarks (*Alauda alpestris*) daily.	An unusual number of Shorelarks, particularly in Norfolk in November.
1870.	
From September until November, very great numbers of Richard's Pipits (*A. ricardi*).	
On October 20th, thousands of Great Tits (*Parus major*).	
In October and November a great many Little Gulls (*Larus minutus*).	
1871. 1872.	
Herr Gätke's Heligoland notes for these two years are unfortunately lost.	
1873.	
In September and October, a great many Richard's Pipits (*A. ricardi*).	
In September and October, Lapland Buntings (*Emberiza lapponica*) in great numbers.	
In December, a great many Fulmar Petrels (*Fulmarus glacialis*).	

Island of Heligoland.	East Coast of England.
1874.	1874.
In October and November, enormous numbers of the Pomatorhine Skua (*Stercorarius pomatorhinus*).	In December, some Pomatorhine Skuas in Yorkshire.
In October and November, enormous numbers of the Shorelark (*A. alpestris*).	
1875.	
In January, thousands of the Common Gull (*Larus canus*).	
In April, great numbers of the Shorelark (*A. alpestris*).	
1876.	1876.
In February, tens of thousands of the Skylark (*A. arvensis*).	
In February, great numbers of the Twite (*Linota montium*).	
In October and November, a great many Short-eared Owls (*Otus brachyotus*).	During the autumn a great flight of Short-eared Owls.
At the end of October, thousands of Jays (*Corvus glandarius*).	
In November, Wrens (*Troglodytes europeus*).	October 17th and 18th, Wrens very plentiful in Yorkshire (J. Cordeaux, Zool. p. 48).
1877.	1877.
In November, many Wrens (*T. europæus*).	In November, many Wrens in Yorkshire (Zool. p. 48).
1878.	1878.
In January, countless flights of Fieldfares (*Turdus pilaris*).	[Scarcity of Fieldfares in the early part of the year noticed by Mr. Cordeaux, Zool. p. 243].
In January, a stream of Red-throated Divers (*Colymbus septentrionalis*).	

Island of Heligoland.	East Coast of England.
1879.	1879.
In January, thousands of Razorbills (*Alca torda*).	
In September and October, great numbers of Pomatorhine Skuas (*S. pomatorhinus*).	In October great numbers of Pomatorhine Skuas.
In September and October, great numbers of Fulmar Petrels (*F. glacialis*).	In October, four Fulmar Petrels in Norfolk (Stevenson, Zool. p. 340).
At the end of October, and in the beginning of November, enormous numbers of Shorelarks (*A. alpestris*).	In November, nine Shorelarks in Norfolk (Stevenson, Zool. p. 340).
In December, Red-throated Divers (*C. septentrionalis*) passing almost by the million.	
1880.	1880.
In May, millions of Redstarts (*Phœnicura ruticilla*).	
July 4th, astounding numbers of Curlews (*Numenius arquata*).	[July 4th, large flocks of Wimbrel observed at the mouth of the Tees (Zool. 1881, p. 25).]
In August, great numbers of Grey-headed Wagtails (*Motacilla flava*).	
In August, countless numbers of the Pied Flycatcher (*Muscicapa luctuosa*).	
In September, a great many Redstarts (*P. ruticilla*).	During the last week in August and the first week in September, great numbers of Redstarts.
In September, thousands of Chaffinches (*Fringilla cælebs*).	In October, great numbers of Chaffinches.
In September, thousands of the Siskin (*F. spinus*).	
On September 5th, enormous numbers of the Little Gull (*L. minutus*).	

Island of Heligoland.	East Coast of England.
1880.	1880.
In October, a great many of the Short-eared Owl (*O. brachyotus*).	In October, considerable numbers of Short-eared Owls (Rep. on Mig. p. 33).
In October, some Grey Shrikes (*Lanius excubitor*).	In October, a considerable immigration of Grey Shrikes (Rep. on Mig. p. 33).
In August, September, and October, enormous numbers of the Sparrow Hawk (*Accipiter nisus*).	
In November, thousands of the Shorelark (*A. alpestris*).	In November and December, Shorelarks were numerous (Rep. on Mig. p. 42).
1881.	1881.
In September, immense numbers of Redstarts (*P. ruticilla*).	In September, a considerable number of Redstarts (Rep. on Mig. p. 19).
In September, numbers of Pied Flycatchers (*M. luctuosa*).	
In September, an immense flight of the Common Buzzard (*Buteo vulgaris*).	In September, the Common Buzzard numerous (Rep. on Mig. pp. 11 and 28).
In October, considerable numbers of Siskins (*F. spinus*).	In October, Siskins very numerous in Yorkshire (Rep. on Mig. p. 23).
In October and November, thousands of Snow Buntings (*E. nivalis*).	In November and December, enormous flocks of Snow Buntings (Rep. on Mig. p. 25).
1882.	1882.
At the end of September and all October, countless numbers of the Hedge Sparrow (*Accentor modularis*), especially on the 6th, 7th, and 8th.	During the first fortnight in September, great numbers of the Hedge Sparrow at Spurn and in East Lincolnshire. On October 8th, extraordinary numbers in some localities.
At the beginning of October, thousands of Jays (*C. glandarius*).	During the Autumn, Jays were noticed to be more abundant than usual in Lincolnshire, Northamptonshire, Hertfordshire, and Hampshire. [In Norfolk, and on the East Coast generally, no increase was observed.]

Island of Heligoland.	East Coast of England.
1882.	1882.
At the end of October, myriads of Goldcrests (*Regulus cristatus*).	In October, thousands of the Goldcrests: chief arrival in Norfolk about the 11th.
1883.	1883.
Great rush of Thrushes (*T. musicus*) on September 24th (Rep. on Mig. p. 35).	Great flight of Thrushes, September 21st (Rep. on Mig. p. 35).
Many Fieldfares (*T. pilaris*) on October 28th, and several other days (Rep. on Mig. p. 36).	Many Fieldfares on October 28th, and several other days (Rep. on Mig. p. 36).
Enormous numbers of Redstarts (*P. ruticilla*) on September 10th (Rep. on Mig. p. 38).	Redstarts numerous in September (Rep. on Mig. p. 38).
"Rushes" of Robins (*Erithacus rubecula*) on September 24th, October 3rd to 7th (Rep. on Mig. p. 38).	"Rushes" of Robins on September 21st and 30th, October 6th and 7th (Rep. on Mig. p. 38).
Twites (*F. montium*) numerous, October 26th to November 7th (Rep. on Mig. p. 43).	Twites numerous in Lincolnshire in October (Rep. on Mig. p. 43).

Although, as will be seen from this table, twenty-seven instances have been found in which a specially marked simultaneous—or nearly simultaneous—migration of a species took place in Heligoland, and on the east coast of England, since 1868; yet there have been at least twenty-two remarkable migrations in Heligoland which cannot be correlated with any in England; while the number of remarkable migrations on the east coast of England which have had no counterpart in Heligoland, as far as Herr Gätke's statistics enable me to judge, is so large, that I have not attempted to collect or enumerate them, though it might be desirable at some future time to do so.

I take it, that this shows that the autumnal migrants which arrive upon the coasts of Norfolk, Lincolnshire, Yorkshire, and Northumberland, are not received from Heligoland as a rule, but from Norway. There are six cases in which a species has appeared first in Heligoland in numbers, and very shortly afterwards in England, and these are perhaps exceptions: they are the Shore-

larks in 1869 and 1879, the Pomatorhine Skuas in 1874 and 1879, the Chaffinches in 1880, and the Snow Buntings in 1881. In these cases, it is very likely that the birds, or some of them, came to England from Heligoland.

According to the observations of Herr Gätke, autumnal migrants, when they quit Heligoland, depart from it in a westerly direction: but the opinion of Aeuckens the birdstuffer,—no mean authority,—does not quite agree with Herr Gätke's, as he considers that migrants quit Heligoland in a south-westerly direction (*vide* 'Siberia in Europe,' by H. Seebohm, p. 253). I think it must be dependent on the wind, as on the English coast.

VIII.

ABNORMAL PLUMAGE.

By J. Whitaker, F.Z.S., M.B.O.U.

Read 28th February, 1885.

Nothing to me is more interesting than variety of plumage in birds, and striking as they are in this state (being noticed by the most unobservant persons), it is curious that so little is really known how and why they assume this abnormal clothing. During the last few years a great many birds in this state have come under my notice, and though I have given much time, and asked many questions, I have as yet not come to any definite decision. I find the greater part of birds in this plumage are birds of the year: this I think is accounted for by their striking appearance, and they very soon fall victims to the deadly gun. It is a very rare thing to find an old migratory bird in abnormal plumage, and in my large lot I have only one in this state—a Swallow. This would lead one to suppose that variety is owing to birds being in a bad state of health, which causes them to assume abnormal plumage; and that migratory birds in this state have not strength to come

here, they are weak, and have not power to discharge the colouring matter into their feathers, therefore would not be able to take the long flight necessary to bring them. I remember having read in some natural history magazine, that a white Blackbird had been shot, and on being skinned, the black colouring matter was found under the skin. The bird was no doubt in poor health, or would have been in ordinary plumage. This is not always the case, as I have two white Jays, which appear to have been in the most robust health, their plumage being particularly pure and glossy. Pure albinoes (that is, birds with pink eyes) are born so; and though birds may assume white plumage in after years, they have always eyes of the natural colour. These birds are called white varieties, and are much more common than pure albino. Birds which are varieties without a pink eye are liable to assume normal plumage at next moult. Rarely we find a bird with pink eyes which is not white. I have a cream Missel Thrush and cream Bullfinch which have them, but cases of this kind are *very* rare. Birds in another state of plumage are sandy in colour: these I fancy in some cases have missed moulting, as their plumage sometimes looks worn and hair-like. Water-hens are found like this (see interesting paper by Mr. J. H. Gurney, Jun., Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 581).

The commonest variety amongst birds is a pied one; birds in this state are generally quite as brilliant and healthy-looking as when they are in normal feather. This I cannot account for. We often see a bird with about an equal number of white feathers distributed over its body and wings. Now if lack of colouring matter cause this, how is it that these white feathers look quite as healthy as the normal ones do? The rarest variety is a melanism, and very few birds are found in a state of nature in this dress. I have only noticed the following:—House Sparrow, Hedge Sparrow, Bullfinch, Redwing, Montague's Harrier, Lark, Snipe, Woodcock, and Pomarine Skua.

The subject of variety being so interesting, I trust that other naturalists will give us their opinions. Whether white birds would breed white birds in a wild state has never been proved, for the following reasons—they are so rare, and so much sought after, that even if they lived to the spring, it would be a thousand to one against their finding another abnormal bird to pair with, and

so the variety is lost. But when once a variety has occurred, there is always the chance of its coming out again. For instance, in a rookery in Leicestershire, a few years back a White Rook was hatched, and nearly every year since either white or pied ones have occurred. A good many years ago my father had a black-breasted Red Game-cock, with which he won a lot of money, and the bird was turned down in the yard at home to end his days in peace. He had in his left wing two white feathers. The young birds that sprung from him were without these feathers; but after fifteen years, one of his descendants had the same two feathers white in the same wing. This at once attracted my father's attention, and he told me the tale. Mr. Frederick Bond of Staines, the "Father of present British Naturalists," has the finest collection of birds in abnormal plumage in Britain, numbering seventy-seven species, many unique. I have seventy-two in my collection. Mr. John Marshall has more albinoes than any one, amongst them some wonderful birds. Sir John Crewe, Mr. William Borrer, and Mr. J. H. Gurney, Jun., have also fine series. I have noticed that Larks, Sparrows, Starlings, and Blackbirds are more subject to variety than any other species; but perhaps this is accounted for by their being in greater numbers than other species.

A list of varieties of all the species that I have seen in collections or heard of:—

White-tailed Eagle.* Marshall, Norwich Museum.
Merlin.† Sir J. Crewe.
Kestrel, very light. J. Whitaker.
Kestrel, slightly pied. Norwich Museum.
Sparrow Hawk.*† Marshall and Bidwell.
Common Buzzard.† Norwich Museum.
Montagu's Harrier, melanism. Gurney.
Red-backed Shrike.* Whitaker.
Spotted Flycatcher.* Whitaker, Bond, and Marshall.
Missel-toe Thrush.*†
Song Thrush.*†
Fieldfare.*†
Redwing *† and melanism. J. Whitaker.
Blackbird.*†
Ring Ousel.†
Hedge Accentor.*†
Redbreast.*†
Redstart.† Whitaker.
Stonechat.†
Whinchat.*†
Wheatear.*†
Sedge Warbler.* Bond.
Reed Warbler.* Bond.

* White. † Pied.

Nightingale.* † Whitaker.
Blackcap Warbler.* Marshall.
Whitethroat.* †
Lesser Whitethroat.* Bond.
Wood Warbler.* Whitaker.
Willow Warbler.* Bond.
Chiffchaff.* Whitaker.
Wren.* †
Nuthatch.* † Gurney.
Great Tit.* † Borrer.
Blue Tit. †
Coal Tit. †
Marsh Tit. †
Long-tailed Tit. † Whitaker.
White Wagtail. † Bond.
Pied Wagtail.* † Whitaker.
Yellow Wagtail. † Whitaker.
Tree Pipit.* Marshall.
Rock Pipit.*
Meadow Pipit. †
Richardson's Pipit.* Marshall.
Skylark.* †
Woodlark. † Whitaker.
Shorelark. † Whitaker.
Snow Bunting.* Bond.
Common Bunting.* †
Yellow Bunting.* †
Reed Bunting.* †
Chaffinch.* †
Bramblefinch.* † Bond.
Siskin. † Whitaker.
Goldfinch.* † Bond.
Linnet. † *
Twite.* † Bond.
Mealy Redpole. Bond.
Lesser Redpole.* † Whitaker.
Tree Sparrow. † Whitaker.
House Sparrow.* †
Greenfinch.* †
Hawfinch.* †
Bullfinch.* †
Starling.* †
Raven.* Marshall.
Carrion Crow.* †
Hooded Crow. †
Rook.* †
Jackdaw.* †
Magpie.* †
Jay.* †
Green Woodpecker. † Bond.
Great-spotted Woodpecker. † Whitaker.
Lesser-spotted Woodpecker.* Sir J. Crewe.
Cuckoo. †
Kingfisher. † Bond.
Swift. † Whitaker.
Swallow.* †
Martin.* †
Sand Martin.* †
Nightjar.* † Marshall and Bond.
Ring Dove.* †
Stock Dove. †
Rock Dove. †
Turtle Dove. †
Pheasant.* †
Capercaillie. † Marshall.
Black Grouse. † Gurney (killed in Norway).
Red Grouse.* †
Partridge * † partly melanism. Whitaker.
Red-legged Partridge. † Gurney.
Golden Plover. †
Lapwing.* †
Oystercatcher.* Gurney.
Ringed Plover. † Whitaker.
Redshank.* † Cookson.
Common Sandpiper. † Whitaker.
Knot.* Bond.
Dunlin. † Gurney.
Sanderling.* Adamson.
Woodcock.* †
Common Snipe.* †
Curlew.* † Marshall, Dublin Museum.
Heron.* Marshall, Dublin Museum.
Night Heron.* Marshall.
Water-rail. † Whitaker, * Marshall.
Land-rail. † Whitaker, * Gurney.
Moorhen.* †
Coot.*

Brent Goose.†
Wild Duck.† Whitaker.
Shoveller.† Whitaker.
Wigeon.† Gurney.
Teal.† Bond.
Garganey.* Gurney.
Pintail.† Marshall.
Scoter.†
Eider Duck.* Bond.
Redthroated Diver.* Marshall.
Rednecked Grebe.* Marshall.
Great-crested Grebe. J. G. Barclay.
Puffin.* Marshall.
Razorbill.† Gurney.
Guillemot.*† Gurney.
Cormorant.*†
Shag.† Whitaker.
Black Guillemot.† Whitaker.
Common Tern.* Gurney.
Arctic Tern. Marshall.
Black-headed Gull.* Bond.
Common Gull.† Whitaker.
Herring Gull.* Gurney.
Pomatorhine Skua, melanism. Whitaker.
Storm Petrel.* Gurney.

The following are some of the most striking varieties I have noticed in Mr. Bond's collection: -A Kingfisher, in which the back and wings have about an equal proportion of white and blue feathers; a beautiful variety of a Bullfinch, back, wings, and head white, breast a beautiful rose colour; Reed Bunting, white, with slight markings of black about head; common Bunting, of a straw yellow; Yellow-hammer, of a beautiful canary yellow; pied Nuthatch; two Goldfinches, white, with bright yellow on wings; white Woodcock, with markings in red; white Eider Duck, Knot, and Dunlin; yellow Great Tit, and Coal Tit with much white about it; cream Nightjar, drab Golden-crested Wren, white Wren, white Hawfinch; melanism of Hedge Sparrow, besides many other interesting varieties. In my collection the following are worthy of mention:—Biscuit-coloured Woodcock, with grey markings in breast and black patches on back (this is an extraordinary variety, having no feathers in common with a bird in ordinary plumage); cream Woodcock, with markings in light-brown; cream Shoveller, with markings in chocolate; pied Jay, with white wings with blue on the white (rare); white Redbacked Shrike, white Nightingale, brown and white Magpie, white Willow Wren, cream Green Plover, dun Carrion Crow, pied Woodlark, dun Yellow Wagtail, white Cuckoo, with markings in red; melanism of Redwing, cream Corn Crake, ash-coloured Water-rail, white Wood Wren, and two pied Swifts (there are only three in England: the other is in Mr. Bond's collection); and cream Green Cormorant, with brown markings. Mr. Marshall has more pure albinoes than any other collector, and

some of the best are white Sea Eagle, white Water-rail, with pink bill and legs; white common Heron, Night Heron, Moorhen, Red Grouse, Nightjar, Black-cap Warbler, Sparrow Hawk, Red-throated Diver, Red-necked Grebe, Arctic Tern, three white Ravens, and many others of less variety. Sir John Crewe has a white Lesser-spotted Woodpecker, with red head; cream Red-backed Shrike, white Sand Martins, white Grouse, and a great variety of Partridges. Mr. Gurney has a white Whitethroat, white Nuthatch, white Ring Dove, pied Blackcock, dun-coloured Snipe, white Land-rail, white Garganey, white Guillemot, and white Common Tern, white Herring Gull, and white Stormy Petrel. Mr. Borrer has a beautifully pied Thrush, yellow Great Tit; light-bluish Robin, with grey breast; white Robin, with red breast; white Bullfinch, with rose breast; and a beautiful pied Chaffinch, as well as several pretty Blackbirds.

IX.

METEOROLOGICAL NOTES, 1884.

By Arthur W. Preston.

Read 31*st March*, 1885.

January.

The main characteristics of this month were similar to those which were conspicuous throughout the year, viz., warmth and dryness. The mean temperature was 41.8, and, with the exception of 1851, this was the warmest January during the past forty years. This is the more remarkable for having been preceded by two extremely mild Januarys. Crocuses, Snowdrops, and other spring flowers were in bloom from the middle of the month. From the 1st to the 21st fine quiet weather prevailed, with winds chiefly from the south and south-west: little rain fell during this period, and the barometer was steady and high. At the 21st the calm and dry weather gave place to windy and wet, with low barometer; but the mildness continued, the thermometer attaining a maximum of

56 degrees upon the 30th. On the evening of the 23rd the barometer fell to 29.28, and a heavy gale and rain prevailed. Pressure recovered itself the following day; but on the 26th it again gave way, and by 10 p.m. a minimum of 28.52 was attained, which is stated to be the lowest recorded here this century. The depression was accompanied by a violent gale and heavy rain, thunder, and lightning. Slight snow fell the following day, which was the only occasion throughout the month upon which snow was recorded. The thermometer fell to 31 degrees upon the 1st, and to 32 degrees upon the 26th and 27th; but these were the only frosts (slight as they were) throughout the month. The rainfall amounted to 1.34 in.

February.

Although the mean temperature of this month was slightly lower than that of January, mildness and drought were the prevailing features. The southerly and south-westerly currents continued till the 14th day, accompanied by quiet and mild weather, and for the most part a high and steady barometer. A change occurred on the 14th to easterly winds, and a fall of temperature; but on the 19th the old conditions returned for a few days. The last three days of the month were much colder, with sharp east wind, and a tendency to snow; the thermometer on the 29th falling to 26 degrees, which was the sharpest frost of the winter. The rainfall was trifling, there not having been a single heavy fall throughout the month; in fact it is said to be the driest February in Norfolk for twenty years past. The total fall for the month was but little over half an inch.

March.

The first two days were a continuance of the cold winds and sleet showers which closed February; but on the 3rd the southerly current again set in, and continued until the equinox. After a wet night on the 3rd the weather continued mild and quiet, with occasional rain until the 13th. On the last-named day the temperature reached 56 degrees, and the following day 60 degrees: and from this time to the 20th a most unusual outburst of warmth and summerlike conditions prevailed, for which the month will remain as remarkable as the previous March was for its severe cold. On

the 16th a maximum temperature of 68 degrees was recorded, and on the two following days the heat was nearly as great. During this period, fine sunny weather prevailed with nearly cloudless skies, causing an unusually early start to vegetation. The mean maximum temperature for the week ending March 19th was 63.2 degrees, against 38.3 degrees for the same week in the previous year. It is a remarkable fact that the mean maximum temperature for the week ending July 31st, 1883, was also 63.2 degrees. At the equinox the usual change occurred, the north-easterly current setting in, and continuing to the end of the month. The rainfall amounted to 1.30 in.; but nearly all this fell during the first ten days of the month.

April.

This was the most ungenial month of the whole year. Although the first week was warm and summerlike, with growing showers, and maximum day-temperature from 60 to 68 degrees; the wind veered to the north and north-east on the 8th day, and remained persistently in that quarter for twenty-two days! During this period, showers of cold rain and sleet frequently prevailed, and the wind was of a very searching description, doing much damage to the fruit trees which were then in full bloom, and being most trying even to the most robust constitutions. Night frosts were frequently experienced, and although the rainfall was not excessive, the number of days on which rain fell was twenty-two. A severe earthquake was felt in the Eastern Counties at 9.20 a.m. on the 22nd, doing much damage in the neighbourhood of Colchester. The shock, although slight at Norwich, was noticed by many people in the city.

May.

The first week was somewhat cool, and chiefly showery, with thunderstorms on the 5th and 6th; but on the 9th the most perfect summer weather set in, which continued with but little intermission till the autumnal equinox. Great heat prevailed on the 10th, 11th, and 12th, a maximum temperature of 78 degrees being recorded on the 11th. The winds were variable, but chiefly from the southward, although the last week produced some rather cold north-easters. Hardly any rain fell after the 6th, and the

total fall of the month was only 0.70 in. There were many days of unclouded sunshine, and notwithstanding the cold winds of April, vegetation was remarkably forward, all trees having their full summer foliage by the 24th.

June.

Although no excessive heat was registered this month, the weather was chiefly fine and very dry, in fact it was the driest month of the year. The rainfall was only half an inch, which is less than in any June during the past forty years. Variable winds prevailed during the first few days, with showers on the 6th, 7th, and 8th, after which northerly currents predominated with dull dry and rather cool weather. The last ten days of the month were bright and very warm, notwithstanding the fact that the wind was from the north and east nearly all the time. A maximum reading of 80 degrees was recorded on the 26th and 28th.

July.

Great heat prevailed during the first fortnight of this month, the thermometer attaining a maximum of 86 degrees on the 3rd and 8th, 87 degrees on the 4th, and 80 degrees and upwards on five other days. Thunderstorms prevailed from the 4th to 6th, and again on the 9th and 10th, but unaccompanied by very heavy rains. On the 21st, the weather became cooler and less settled for a few days, with heavy rains, the falls on the 21st and 24th being 0.78 in. and 0.76 in. respectively. The rain was greatly needed after a drought of nearly eleven weeks. At the close of the month warmer and drier weather again set in.

August.

This was a month of unusual drought and heat, and altogether of a different character to what has been prevalent during the last few years. The heat went on steadily increasing from the 1st to the 11th, on which latter day a maximum of 91 degrees was attained. This is the highest reading recorded since 15th July, 1881, when a maximum of 92 degrees was registered in Norwich; but such extreme readings are of very rare occurrence. The terrific thunderstorm which prevailed at Yarmouth the following day, and travelled

northwards with great severity, was but little felt in Norwich, and although the temperature was somewhat reduced, great heat continued till the 24th, when a maximum of 85 degrees was registered. During this period the sky was nearly cloudless, and more perfect weather for the harvest could not have been desired. A northerly current set in on the 25th, producing a most extraordinary change in the temperature, the maximum reading for that day being only 64 degrees, or 21 degrees less than on the previous day. Showery and cooler weather continued to the end of the month. The rainfall was but 1.26 in., and more than half this quantity fell during the last week. The mean temperature of the month was 66.1 degrees, being the hottest month since July, 1876, and only exceeded in any August during the past forty years in 1842, 1846, 1856, 1857, 1861, and 1868.

September.

Unsettled weather prevailed during the first nine days with frequent heavy rains, that of the 4th being almost unprecedented in the East of England. I registered 2.09 in. in the twenty-four hours ending at midnight of the 4th; and in Suffolk the fall was even greater, exceeding three inches in some places. A great improvement set in on the 10th, the warm dry weather which had characterised the entire summer again returning. Hardly any rain fell during the remainder of the month, and bright cloudless days continued till the last week, when the autumnal equinox brought more cloud and lower temperature. The total rainfall for the month was 3.08 in., but more than two-thirds of this fell upon the fourth day. The prevailing currents during the first nine days were south-westerly, but the warm and clear weather was accompanied by light easterly breezes. From the 23rd to the end of the month the wind was again south-westerly. With the exception of the first week it was a delightful month, and a fitting conclusion to the finest summer we have had for many years.

October.

A variable month with no extremes of temperature, the weather being on the whole of a fine autumnal character. A rather wet period, however, prevailed between the 6th and 14th, the rainfall on the 10th being 1.71 in., and during thirty hours' continuous

rain on that and the preceding day no less than 2.12 in. were gauged. It is somewhat remarkable that two such heavy falls as those of September 4th and October 10th should have occurred in the midst of such a dry season. It is worthy of notice that the barometer which stood at 30.56 on the morning of the 5th, fell gradually and steadily for six days, the minimum of 29.28 being recorded on the evening of the 10th during the heavy rainfall above alluded to. Fine dry weather with variable winds and a medium temperature then ensued and continued to the end of the month, broken only by two days of wind and rain on the 26th and 27th. Although eighteen days were without rain, this was the wettest month of 1884, the total fall being 3.22 in.

November.

During the first nine days the weather was mild and rather unsettled, accompanied by occasional showers, but with an unusual amount of sunshine for the time of year. From the 8th to the 20th the barometer remained above 30 in., a maximum of 30.48 being recorded on the 14th day. During this period "anticyclonic" conditions were prevalent, accompanied by dry but sometimes foggy weather, the wind being chiefly from the east and north. Temperature was not low for the time of year, the thermometer being above 35 degrees all this period. A colder and rainy period then ensued, and heavy snowstorms occurred on the 29th and 30th, the thermometer falling to 24 degrees on the night of the 29th, this being the sharpest frost registered here since the 9th March, 1883. The month closed with weather of a more winterly character than had been experienced for some time past. 2.03 in. of rain fell during the month, 0.23 in. of this being melted snow.

December.

The weather of this month was of two distinct types—a mild period with south-westerly winds from the 2nd to the 20th; and a cold, lull and frosty period with north-easterly currents from the 21st to the end of the month. The cold weather which closed November, continued during the 1st, when snow fell almost incessantly, but at evening the wind veered to the southward bringing heavy rain, and by the morning of the 2nd hardly any

snow remained upon the ground. Temperature was high during the first and second weeks, a maximum of 55 degrees being attained on the 7th ; and although there were no particularly heavy falls of rain, it fell almost daily during the first three weeks of the month. Cold showers of rain and sleet fell during Christmas Day, and from this time to the end of the year the weather remained quiet and dull, with slight frosts. The total rainfall for the month was 2.48 in.

Summary.

From a perusal of the above notes it will be seen how strikingly the year 1884 stands out from its predecessors in many particulars. Producing one of the mildest winters ever experienced, perfect midsummer weather in the middle of March, a warm and dry summer from the beginning of May to the end of September, with such a succession of hot days and clear skies as were hardly ever before remembered, it may well be considered one of the most remarkable years of the present century. During the summer the thermometer attained 75 degrees and upwards on no less than 52 days, and on 30 of these days it stood at 80 degrees and upwards. Such a large number of hot days have not occurred in any summer since 1868. From an examination of records of past years it may be seen that the hottest summers of the present century were those of 1808, 1818, 1826, 1840, 1842, 1846, 1857, 1858, 1859, 1865, and 1868, and that of 1884 may certainly be added to this list. The hottest day of the year was August 11th (91 degrees), and the coldest night November 29th (24 degrees). The rainfall of the year was only 20.88 in. which is the lowest for 20 years past. Three months (February, May, and June) were excessively dry, three (January, March, and August) dry, four (April, July, November, and December) about the average, and the remaining two (September and October) rather wet. The warmth and dryness of 1884 will form a pleasing contrast to the wet and coolness of the seven years immediately preceding it, and it is to be hoped that the year just past is the prelude to a continuance of fine summers and sunny skies, and with them brighter prospects for all.

1884.

Month.	Barometer.				Thermometer.					Rainfall.		Direction of Wind.							
	Highest.	Date.	Lowest.	Date.	Highest.	Date.	Lowest.	Date.	Mean.	Rain.	No. of days on which 0.01 or more fell	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Jan.	30.57	16	28.52	26	56	30	31	1	41.8	1.34	15	6	0	2	0	3	16	8	2
Feb.	30.37	3 & 4	29.49	9	53	13 & 20	26	29	40.9	0.62	12	0	1	7	0	8	8	1	3
March	30.21	6	29.31	10	68	16	27	2 & 27	44.6	1.30	12	0	6	5	1	7	4	6	2
April	30.09	13	29.48	5	68	2	27	23	45.8	1.69	21	4	15	1	4	5	1	0	0
May	30.30	22	29.32	3	78	11	35	6	55.0	0.70	10	3	8	2	0	3	10	3	2
June	30.21	12	29.57	7	80	26 & 28	42	10	58.6	0.52	9	9	3	7	1	3	1	2	4
July	30.11	30	29.63	10 & 16	87	4	46	19	65.1	2.64	15	1	0	1	5	5	12	6	1
Aug.	30.20	4	29.62	28	91	11	46	5 & 26	66.1	1.26	10	2	1	3	13	2	3	6	1
Sept.	30.24	18	29.37	4	78	17	40	29	59.4	3.08	11	2	4	6	2	3	7	4	2
Oct.	30.56	5	29.28	10	61	2, 6, 17	32	24	48.5	3.22	13	1	2	0	3	4	3	10	8
Nov.	30.48	14	29.63	20	58	7	24	29	42.2	2.03	16	7	1	3	2	4	6	2	5
Dec.	30.25	31	28.67	20	55	7	26	30	39.6	2.48	18	5	2	4	2	2	11	5	0
Totals										20.88	162	34	43	41	34	49	82	53	30

X.

NOTES ON THE HERRING FISHERY OF 1884.

By Thomas Southwell, F.Z.S.

Read 31st March, 1885.

The Herring Fishery during the year 1884 presents some remarkable features, and calls for a more lengthy record than I have been accustomed to give. I trust I may be pardoned, therefore, if I enter more into details than I have done on previous occasions.

Notwithstanding the unexceptionable weather which prevailed, and the consequent absence of interruption, and immunity from loss of boats and gear which too frequently occurs in less propitious seasons, and although the catches have been the largest on record, still, owing to the fact that the fish when caught did not pay for bringing ashore, the result of the past season's voyage has been very disastrous to all concerned. Surely there is something wrong here: and it is worth considering whether there is any assignable cause for such an anomalous state of affairs.

So lamentable is our ignorance with regard to the distribution, food, habits, mode and periods of reproduction, and general economy of sea fishes, and so meagre the statistics relating to the fisheries generally, both in times past and in the present, that it is impossible to form any reliable estimate as to their relative productiveness at any given periods. There can be no doubt we are working absolutely in the dark, not knowing, and I fear not much caring, whether we are over-fishing the once teeming waters or not. Of late years the fleets which leave our east coast fishing-stations have quite changed their character, as well as their mode of operation; both vessels and gear are vastly superior to those formerly in use; and the powerful trawlers, propelled by steam, or attended by steam-carriers, employ apparatus immensely more efficient than of yore; whilst the markets opened up by more rapid communication are simply insatiable. The question naturally arises: Is the yield of fish taken by our fifty-feet beam-trawls, and the many miles of added drift-nets, relatively larger

than that of years gone by? If so, are we taking more fish out of the sea than is legitimate, and thereby ruining the fisheries? or are they already so depleted, that it requires all this additional exertion to maintain the supply? As I said before, there are no sufficient data to enable a definite reply to be given to these momentous questions; but it is obvious that, with this vastly increased expenditure of capital and skill, a proportionately large increase in the result ought to follow, otherwise the only logical conclusion which it would be possible to arrive at is, that the depletion of the fishery grounds has rendered it more and more difficult to obtain a given result. Opinions differ in the interpretation of such scant evidence as we do possess; but I am firmly of opinion that the sea is not inexhaustible, and that if we continue to fish with such deadly engines in season, and out of season, as at present, the result cannot fail to be most fatal. Having regard to the magnitude of the interest at stake, it seems quite beyond conception that the Government should so long delay the appointment of a really competent English Fisheries Board, whose duty it should be to study the habits and economy of the fish, and to collect reliable statistics with regard to all matters directly and indirectly affecting the sea fisheries, with a view to passing such legislative enactments, if any, as the experience of the Board may indicate to be desirable.

Were this done, I venture to predict that the Spring Herring Fishery, as well as the size of the mesh now in use by the drift-net fishers, would speedily receive attention. Another legitimate object for investigation by such a body would have been the cause of the altogether exceptionally vast influx of Herrings upon the East Coast which occurred last year; and we might also have hoped for information which would have thrown some light upon the inferior condition of the fish themselves. It has been suggested that the presence of such unusual quantities of fish was due to the abundance of food which swarmed in the abnormally warm seas, resulting from the great heat of the past summer. If this were so, the fish should have been in prime condition, whereas the reverse was the case; and to this very cause (the high temperature of the water),—which although favourable to the production of their food, was by others considered prejudicial to the Herrings themselves,—has been attributed their poor condition.

One thing only is certain, and that is, our unpardonable ignorance and indifference with regard to the whole matter.

Early in the autumn fishery, the numbers of Herring brought in were very large indeed; and it is reported that in very many instances whole cargoes were sold for manure, the fish being in such a condition as to make it impossible for them to undergo the curing process. Many fish were sold at prices varying according to quality (or rather want of quality) from 25s. to £4 per last, so utterly bad was the sample. These low prices ruled more or less during the whole season, simply owing to the worthless character of the fish: for no sooner did an occasional cargo of superior quality come in, than it was readily disposed of at prices varying from £12 to even £20 per last. Indeed the most noticeable features (next to the enormous supply) during the whole season have been, the inferior quality of the fish, and the excellent prices commanded by the few lots of prime fish which were occasionally brought in. It is true, that towards the close of the season the quality of the fish somewhat improved; but as the November Herrings are always regarded as the choicest produce of the season, this was only what might be expected. It is nevertheless a fact, that the whole East Coast Herring Fishery, from Wick southward, has been unprecedentedly bad both in quality and prices. The fish which I saw landed at Peterhead, in August, were precisely the same in quality as those landed on the Yarmouth fish-wharf two months later, and the Scotch curers suffered most severely, as did both owners and men at our own ports.

Two things appear obvious from a careful study of the reports of the past season's fishery: first, that we commence too soon, in fact, as will be seen from the table appended, the fishery is going on during the whole year whenever there is a fish to be got; and secondly, that we take a great many Herring which never ought to be removed from the sea. Speaking of the spring fishery, the late Mr. Buckland very justly condemned the destruction of such fish, and declared that they were not fit food for pigs, and only serviceable for bait or manure. Mr. de Caux says the full-grown North Sea Herring should measure from 10 to 11 inches in length; I have repeatedly measured Spring Herring which did not exceed 7¼ to 8 inches in length. It is notorious that, were nets of proper size of mesh used, taking such fish would be an impossibility.

And this brings us to what in the opinion of many, who are most competent to speak with authority, is the root of all the evil. Up to the year 1868, the size of the mesh was regulated by Act of Parliament to one inch from knot to knot; but in that year the restriction was removed, and every man left to do what is right in his own eyes. The result is, that many nets, instead of being thirty-six meshes to the yard, are forty to forty-three meshes. In his book on the Herring, Mr. de Caux speaks very strongly of the folly of decreasing the size of the mesh; "firstly, because, as the public prefer large Herrings to small ones, whenever there is a *large* delivery of *small* Herrings, the prices fall rapidly; and, secondly, because small mesh nets will *kill*, but *will not catch*, large full Herrings. A small mesh simply catches a large Herring by its nose, and not by its gill covers; and, therefore, the Herrings so meshed and killed are held so lightly that, when dead, they drop out of the meshes with the motion of the sea, or the hauling in of the net, and, of course, are lost to the fishermen." Never was the wisdom of Mr. de Caux's argument more strongly exemplified than in the past season. The "*large* deliveries of *small* Herrings" sent the prices down to almost nothing; and these wretched things, which would have passed through a one-inch mesh, were taken to the exclusion of the big fish, which would have been both more valuable for food, and have brought remunerative prices to the fishermen. What will be the result when the North Sea Fishery Commissioners have exposed all the domestic arrangements of the Herring, and taught the fishermen to follow up the unhappy fish with the more exact knowledge of their haunts and habits which continued research will doubtless reveal, and with the thermometer trailing over the boat's quarter to indicate when the sea is at "Herring-heat," it is not difficult to imagine—provided they are also allowed to sweep up shoal after shoal with their small-meshed nets, as they have done in the past season, aided only by the old-fashioned "rule of thumb."

In addition to the unremunerative nature of the fishery, the owners have suffered severely from the depredations of the foreign trawlers. The ruthless manner in which the Belgian trawlers are allowed to cut adrift, and often carry bodily away, the drift nets of the Herring fleet, is a disgrace alike to the Belgian as well as to our own Government. The loss sustained by our fleet during the

past season must, by all accounts, have amounted to many thousands of pounds; and it seems incredible that means are not taken to protect so important an industry from the wanton depredations of foreigners. Mr. E. Birkbeck, M.P., at a recent meeting of the National Sea Fishery Protection Society, is reported to have stated that he believed the Lowestoft fishermen alone had lost upwards of £10,000 from this cause during the past year. We are promised that one of the recommendations of the late trawling Commission will be, that properly equipped cruisers, with commanders having jurisdiction in small offences, should be employed for better police supervision over fishermen of different nationalities when at sea; and there can be no doubt, whatever difference of opinion there may be as to the correctness of the conclusions arrived at by the Commissioners on some other points, that this particular recommendation will give universal satisfaction.

The spring fishery practically commenced in March, and from the first the catches of fish were very large. From Yarmouth little is done at the spring fishery, although, I regret to say, the returns are annually increasing. In the past season, the Yarmouth boats landed 743 lasts, compared with 342 lasts in that which preceded it; but the Lowestoft owners prosecute the spring fishery with greater vigour. Early in March large arrivals took place at that port, which increased as the season advanced, till a total of 3087 lasts was reached, as compared with 2718 lasts in the previous season. The first fish which came in sold at from £22 to £23 per last; but the price soon fell, owing to the large deliveries, till it varied from 26s. to £7 per last, the latter being an extreme price. During the months of May, June, and July, very little is done in the fishery; but the autumn voyage, which usually commences in September, in the past season opened from Yarmouth early in August, and during that month 1864 lasts of fish were landed at the wharf. With September the fishery set in in earnest, and the depressed state of the trade, which never rallied during the remainder of the season, made itself felt at once. The reports say that large quantities of fish were landed daily, which would not fetch £4 per last (13,200 fish), and that tons of salted fish were sent away for manure. The fish were under-sized, and of bad quality, and did not pay for the labour of catching. The trade to the Levant was almost ruined in consequence of the outbreak of cholera, and the

prospect was cheerless in the extreme. The Lowestoft trade was even worse: and early in October herrings were selling, owing to the "miniature character" of the fish, at £2 10s., £1. or even 10s. a last; and the shoals from which they were taken were so numerous, that several of the boats are said to have lost half, or even more than half, of their nets, so heavily were they laden; and yet, when a few good fish did arrive, they fetched very remunerative prices.

Large as the deliveries continued to be, the 4th of November exceeded anything which had previously been known both at Yarmouth and Lowestoft. At the former port the scene was most exciting: "at the wharf the boats were lying five or six deep," and many had to be brought quite up the river as far as the Haven Bridge, and it was near midnight before the whole of the 240 boats which came in had discharged. It is believed that at least 1300 lasts were landed, equal to 17,160,000 fish! At Lowestoft the scene was also very exciting, and a very large quantity of fish was landed. All the boats arrived with good catches, many with 10 or 12 lasts, and one boat is said to have brought in 14 lasts of fish. The fish were of excellent quality, and are said to have averaged £5 10s. per last. The large deliveries continued, and the official return shows that 5518 lasts were landed at the Yarmouth Fish-wharf alone in the week ending the 8th November. The shoals were just off the town of Yarmouth; and the fish arrived so fresh, that they presented a beautiful appearance, the heaps glistening in the sunlight, and displaying all the hues of the rainbow.

Towards the end of November the quantities of fish began to fall off; and the middle of December brought to a close, perhaps the most remarkable season ever experienced, and one that will long be remembered as most disastrous both to boat-owners, curers, and fishermen.

The number of boats sailing from Yarmouth and Lowestoft was about 620, employing some 6500 men and boys. About 400 Scotch and North Country boats also used these ports, manned by about 2800 hands all told.

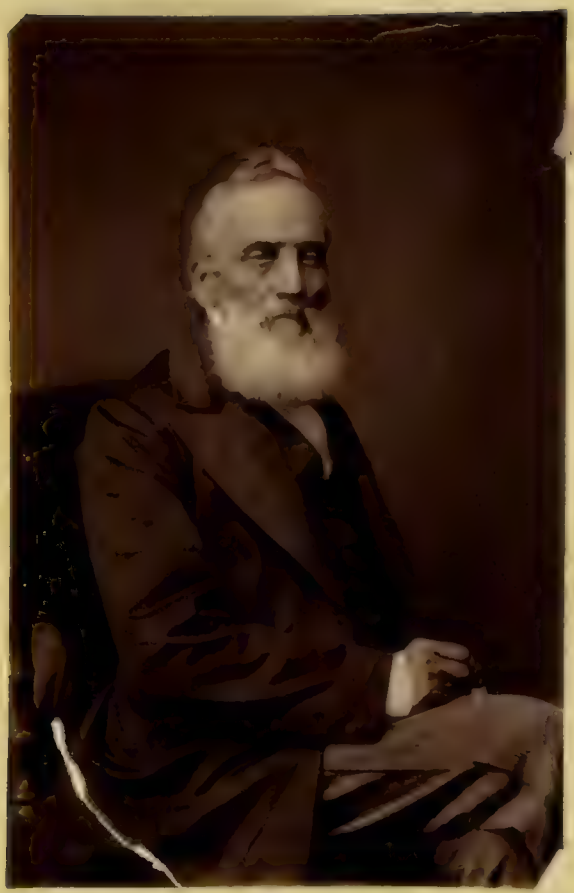
The joint produce of the two local ports for the year 1884 amounted to 38,258 lasts, equal to 505,005,600 fish—a number which it is impossible to grasp. These numbers may be relied

on, as they are shown by the books of the fish-wharves to have been actually landed; but there are no available statistics as to price, and it is impossible to form anything but a guess as to the average yield per last, so greatly does the value fluctuate owing to varying quality or supply; nothing short of a thorough analysis of the salesmen's books would yield really reliable information; but I am assured by a gentleman thoroughly conversant with the market, that the prices realized this season will certainly not average more than half those of last year, which were about £15 per last. This would represent, say, £7 as the price per last, and I am inclined to believe that this is rather over than under stated. At this rate the produce of 1884 would represent a sum of £267,806; whereas the produce of 1883 (viz. 30,335 lasts), at £15 per last, would realize £455,025, or £187,219 more than that of the past season, notwithstanding an excess of 7923 lasts over that of 1883. Of course these figures have no pretensions to exactness, as a difference of a few shillings in the average price per last would seriously affect the totals; but I think they may be regarded as rather understating the deficiency in the past year than otherwise, and will show the vast importance, not only of quantity, but of quality also.

As on previous occasions, I am again indebted to Mr. H. Teasdel, Jun., the Corporation Accountant at Yarmouth, and Mr. Massingham, Harbour-master of Lowestoft, for the official returns from their respective ports.

RETURN OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1884.

		Yarmouth.			Lowestoft.		
		Lasts (13,200).	Thousands (1320).	Hundreds (132).	Lasts (13,200).	Thousands (1320).	Hundreds (132).
Spring	January	—	6	—	—	—	—
	February	3	—	5	5	9	7
	March	327	3	3	1370	1	2
	April	409	2	9	1674	6	7
	May	3	1	5	36	3	8
Summer	June	6	2	2	1	—	6
	July	128	7	8	—	—	—
	August	1864	4	8	173	4	3
Autumn	September	3894	8	1	341	8	6
	October	6578	4	2	2594	6	4
	November	10070	9	9	6496	6	6
	December	1352	4	4	924	—	2
		24,639	5	6	13,618	8	1



Yours very truly
John Scales

XI.

MEMOIR OF THE LATE JOHN SCALES.

By Alfred Newton, M.A., F.R.S.

Read 24th February, 1885.

Apology is needless for offering to Norfolk Naturalists a Memoir, however imperfect, of one of their predecessors, whom the present writer believes to be fully deserving of such a posthumous tribute, though the difficulty in composing it, arising mainly from the want of materials, has been exceptionally great, and its incomplete character will be evident at a glance. The advanced age—over ninety years—to which the late Mr. Scales attained, thus outliving nearly all his contemporaries and the friends of the period when he lived in the county, as well as the fact that nearly all the results of his labours—the botanical and zoological collections formed by himself and his father before him, together with the papers, whether catalogues or correspondence, referring to them—perished in a disastrous fire more than twenty years since, are alone enough to account for the deficiencies of the present obituary sketch. Were it not that some fragmentary remains have fortunately been preserved; and, by favour of Mr. Robert Henry Scales (the only son of the deceased naturalist), placed at the disposal of this Society, it would have been hardly possible to do more in honour of so worthy a Norfolk naturalist than to record the date of his birth and of his death; for, though possessing, as is shewn by those of his letters which exist, a fluent pen, he never used it to publish any account of his researches or discoveries; and we may look in vain into the recognised records of zoological or botanical literature for any printed contribution to sciences in which he was, throughout his long career, deeply interested, and with which he had made himself thoroughly acquainted. It is always unsafe to ascribe to any one motives for the doing or not doing such or such things; but in this case it may be perhaps allowable to suggest that the active, practical life which Mr. Scales led while he had the best

opportunities for study and observation, hindered him from giving to the world his own experience or his comments upon that of others. On fitting occasion, however, it is sufficiently clear that he communicated facts of no small interest in regard to Natural History to his correspondents, who, as his son informs the present writer, were very numerous, and some of these facts have found mention—not always, it would seem, correctly—in print. It must also be remembered that during the greater part of the period of Mr. Scales's residence in Norfolk, namely, from 1808 to 1842, there existed no such facilities as now present themselves to almost every country naturalist, for making known his experience; and, though for the latter part of the time the foundation by Loudon of the 'Magazine of Natural History'* did give the much-wanted opportunity, yet the habit of privately confiding an interesting discovery to some discreet and esteemed correspondent, instead of forthwith making it the property of the public (as is now the almost universal practice), must have been so well confirmed in a man of middle-age, that the establishment of a journal, so respectable, and so ably supported as Loudon's undoubtedly was, would hardly form an inducement to break it. There is also another point which, delicate as it is, a biographer, to be true, cannot wholly overlook. It is almost certain that prosperity did not, even in those days, smile upon Mr. Scales, and he may well have felt that his circumstances forbad him to court publicity.

John Scales, the subject of this memoir, was born at Cottingham, near Kingston-upon-Hull, in Yorkshire, on the 21st of March, 1794, being the eldest son of Robert Scales, of Holme† (born on

* The second volume of this magazine contains (pp. 288, 289, 292, 298) several communications from "J.S.," dated Thurgarton, Norfolk, April 17th, 1829; but I see no reason to ascribe their authorship to Mr. Scales. The fourth volume has a note (pp. 430, 431) signed "William Scales, Stamford Hill, April 12th, 1831," who may possibly have been the naturalist's brother of that name, born in 1799, but there is no evidence in favour of such a supposition.

† The Scales family was of East Anglian, if not of Norfolk origin; and, through Mr. Southwell, I am indebted to Mr. William Harteup, of Upland Hall, near Bungay, for a copy of the inscription on the monument of Robert Scales, who died at the early age of twenty-nine years, November 7th, 1728, and was a considerable benefactor to the church and parish of St. Mary's, Bungay.

the 22nd of November, 1765) and Frances his wife, daughter of Colonel Cumbrey. Robert Scales was a zealous entomologist, as is already known from the references to his studies and discoveries that were long ago published by Haworth—his brother-in-law, and by Kirby; and the letters, hereto appended, from several of the best entomologists of the day, those just named among the rest, will serve to shew the estimation in which the writers held their correspondent (Appendix A). Some years after the birth of his eldest son, the father removed from Yorkshire to London, or its neighbourhood, in order more particularly to attend to a Spanish business in which he was largely interested: and his children, with his household-goods, were sent by sea from Hull to London. In the course of the voyage the ship was seized by a French cruiser, and the crew and passengers were taken prisoners. In this condition John Scales, with others, was landed in France, and there detained until ransomed by his father,* who, on leaving Yorkshire, settled in Walworth, where he continued successfully to carry on his zoological pursuits; for, notwithstanding its neighbourhood to London, his new abode was in those days to be accounted a country village, and Camberwell and Dulwich, as well as the fields then lying between Kennington and Battersea, offered good ground for entomological excursions, in which his son JOHN seems to have been his constant companion; while the residence of a practical entomologist like his connection, Haworth,† at Chelsea, afforded additional opportunities for and encouragement in insect-research. Under circumstances so favourable, the taste for Natural History, which we may well believe was inborn in the younger Scales, was fostered and matured. The boy was, however, subsequently sent to school at Lewes in Sussex, where he remained till the end of 1808, being then fourteen years

* This singular event seems to have happened at the end of the last century, as I find from documents before me that William, the fourth child, was born at Cottingham, March 7th, 1799, while Elizabeth, the fifth child, was born at Walworth, May 9th, 1801. The exodus of the family from Yorkshire no doubt took place between those dates.

† Adrian Hardy Haworth, F.L.S., author of 'Lepidoptera Britannica,' and several essays on various subjects connected with zoology and botany, died of cholera, August 24th, 1833, aged 66.—'Entomological Magazine,' i. p. 525.

of age.* But about this time, the father bought an estate at Halvergate near Acle in Norfolk,† and John Scales, upon leaving school, was apprenticed to Mr. Richardson, a chemist in Norwich, with the intent that he should follow the profession of medicine. That idea was, however, afterwards abandoned; for, at the end of four years (in 1812), Robert Scales, who had in the meanwhile sold the property at Halvergate, took the lease of a large farm and of the warren—consisting of about 3500 acres—at Beachamwell, and, falling into ill health, required the assistance of his son in managing so extensive an undertaking.

This may be considered the turning-point of John Scales's life. In the practice of agriculture he found room for the application of the scientific tastes, which he had either inherited or contracted from his father and uncle, and he entered with zeal into everything appertaining to the culture of the soil. At the same time, far from neglecting his former pursuit of Natural History proper, he enlarged its bounds, and added the active study of ornithology‡ to that of entomology. Unlike most other Englishmen, he did not confine his attention to the Natural History of this country alone. He seems to have taken early advantage of the re-opening of the continent, which followed the establishment of peace, and to have travelled abroad whenever opportunity presented itself.§ He was in Paris in 1816 or 1817—if not, as seems possible, in both of

* This school was called "The Academy," and it appears from the printed programme of a theatrical performance there by the pupils, that in October, 1808, John Scales played the part of *Sir Robert Bramble* in 'The Poor Gentleman,' his brother Robert (born 1797) representing that of *Mary Harrowby* in the same piece.

† The family Bible shows that Robert Scales's ninth child, Henry, was born at Halvergate, January 5th, 1809.

‡ It was somewhere about this time that he became possessed of the magnificent male specimen of the Bustard, now in the Norwich Museum (*cf.* Stevenson, B. Norf. ii. p. 32, and *infrà* App. C).

§ Mr. R. H. Scales informs me that his father was a good French linguist, not a common thing for an Englishman in these days, and still rarer in those. He can hardly have acquired the accomplishment during the captivity of his childhood, but in whatever way he learned the language, the knowledge of it would, of course, make his foreign tours far more agreeable and instructive.

those years—and while there was introduced to all the principal naturalists of the Jardin des Plantes, among others making the acquaintance of Dufresne, who had been conservator of the cabinet of Natural History maintained at Malmaison by the ex-Empress Josephine;* and from him, as he many years after informed the present writer, obtained the beautiful specimen of a Great Auk's egg, so long the chief treasure of his oological collection. In the year 1819 there appeared his first, if not his only, printed communication on Natural History. This was dated from Beachamwell, June 14th; and, having for its subject the natural relations of Gooseberry-bushes, Lady-birds, and *Aphides*, was printed in the 'Norfolk Chronicle,' and is appended to this Memoir (Appendix B).

It is not in the writer's power to give many more particulars of this period. Several letters addressed to Scales,† in 1821, by Mr. Robert Hamond, so well known for his sporting and ornithological predilections, are among the documents placed at the service of the Society; but though they shew the confidence existing between the two men, and the love of birds which each possessed, there is in them little suitable for publication here. In one written (July 25th, 1821) from Colesborne, in Gloucestershire, where Hamond was staying, he says:—"I beg nobody will unnail the Bustard case, or move any of the others"—no doubt referring to the celebrated case of specimens now at Congham House.‡ In another letter (August 18th, 1821) from Cheltenham, where he was taking the waters, Hamond tells how at Colesborne he had found larch-apples lying on the ground, and had been sure they were the work of a bird, whose note he was not acquainted with, but had heard the day before, till hiding himself he "saw a Crossbill working the apples most tremendously," which Crossbill he watched "to another tree where there were young ones, about a month or five weeks old, which were being fed by the female. I called for a gun to be sure I was correct, and told Elwes's groom who was looking at them to shoot one, which he did, and it proved to be the hen bird. She had evidently been sitting, her

* *Cf.* Proc. Zool. Soc. 1879, p. 3.

† These are the earliest letters to him that have come into my hands.

‡ For particulars of these specimens see Mr. Stevenson's 'Birds of Norfolk' (ii. pp. 33—35); and also *infrà* (App. C).

breast being perfectly bare. Not being in plumage and [I] not being well I did not perform upon her. I would not let the male bird be shot, though I saw him and heard the young ones repeatedly afterwards. . . . This is the first time I ever have known them to breed in this country . . . and shall like to hear your opinion on the subject. William Elwes's servant when I called him to see the bird, said directly that there was a nest there this year." Nine days later he writes:—"Since I wrote to you last I have seen a great many Crossbills in cages for sale, and was informed by a mechanic that there were a great many taken a little time since on Claverton Downs, which I think is near Bath." In anticipation of his return to Norfolk he adds:—"I expect to see some great performances of the ornithologist when I draw over to the Rabbit Warren;" and no doubt at this time Scales was busily occupied with his collection of mounted birdskins and of eggs.* Another letter from Hamond, again at Cheltenham, in which he describes himself as having just undergone a painful operation, and still being a pitiable invalid, seems from internal evidence† to have been written in 1823. In it he says:—"I was about to visit a brother ornithologist in Northumberland who is now undertaking a most magnificent work on British birds, which will be published speedily: and may be had by subscribers only. If you are about to visit London, you may see it at Hurst and Robinson's, Cheapside. I have been amusing myself these last three days in purchasing books opposite my lodgings where I can *lay* and bid as there is an auction every day. Amongst a lot I yesterday purchased are the

* Among the other letters belonging to this period is one signed B. Corbet, and dated 63 Piccadilly, Dec. 17th, 1821, the writer being evidently a bird-stuffer and egg-dealer in London, and naively stating, "the Bustards are the best birds you could send me," but adding, "I hate presents, I always consider them as baits."

Another letter to Scales from a Mr. John Cooper of Bungay (Dec. 25th, 1821), refers to a collection of eggs sent to the writer, who was so sanguine as to suppose himself the possessor of a Jack Snipe's egg, which, in return, he sent for inspection. Mr. Southwell has kindly ascertained for me, from Mr. Hartcup, before mentioned, who was an intimate friend and one of the executors of Mr. Cooper, that among his papers there are unfortunately none of Scales's letters.

† *Cf.* Trans. Norfolk and Norwich Nat. Soc. ii. p. 400.

Birds of Africa, in six volumes with most brilliant plates by Levaillant, which are valuable and scarce. Amongst my valuables and curiosities I have a white Rat with Ferret eyes, alive: five having been caught a few days ago at a farm-house near Cheltenham. My friend is very handsome, but very ferocious. I shall introduce him into Norfolk as soon as my Æscalapius permits me to leave this place. . . . I have seen no cove that understands or cares about ornithology, although I have plenty of visitors. I just give you these few lines to let you know I am not defunct, but shall hope yet to rally and yet show some sport with the buck-hounds provided I can get Stags, for which I am now straining every nerve."

It is almost unnecessary to point out that the Northumberland ornithologist mentioned in the preceding extract was Selby, who in 1821 visited Norfolk, and a letter of his to Scales from Twizel House, January 21st, 1825, throws more light on the latter's proceedings at this period, so that the following extracts may be introduced here with advantage:—

"You will I am afraid, have already imagined that I had forgotten the promise I made when last I had the pleasure of seeing you at Swaffham, to communicate with you by letter. This however is far from being the case. But my time has been so thoroughly occupied in preparing the plates of the Bustards for the 'Illustrations of British Ornithology' that I have not had a leisure moment to spare upon any other matter. I have now got them finished, and as the letter-press, as well as the other subjects contained in the last fasciculus, are nearly ready for publication I hope it will be before the public in a month or six weeks.

"As my collection of British insects is at present almost exclusively confined to the *Lepidopterous* Insects of my own county, you cannot err in sending me specimens of all your rarer *Coleoptera* and such of the *Lepidoptera* as are peculiar to Norfolk or other southern parts of England. . . . . I hope your father has perfectly recovered the indisposition under which he laboured when I was in Norfolk."

In the summer of this year Scales accompanied his friend Hamond on a tour through France to Switzerland, returning down the Rhine and through Holland to Valkenswaard, as would seem from a long letter, bearing date Zurich, August 7th, 1825, and addressed to Miss Scales—his sister Elizabeth—in which he narrates that part of his journey from Geneva. It would be useless here to quote descriptions of scenery that has now become familiar to almost

every reader.* It is enough to say that Scales was thoroughly appreciative of its beauties, and his letter, doubtless, gave great satisfaction to his family and friends at home; but the following extract deserves insertion:—

"We are now 400 miles from Valkenswaard, and I have passed over 1500 miles since I left Beachamwell, and when I reach home I shall have passed over nearly 2500 miles of land and water. I shall stay a few days at Valkenswaard to get a little rest as Mr. H.'s servant and myself who took it in turn to ride have walked about 240 miles in the last eight days, and I do not feel so well as I have been. Mr. H. rode all the way on horseback. I shall be glad to reach England although I am most charmed with Switzerland in many points of view, and have received the highest marks of friendship from my friend who is quite well and desires to be remembered to all. I am now exceedingly anxious to be doing something for myself and feel that I am losing daily the most valuable part of my life. I received a very affectionate letter from Betsy and am very desirous to be in a situation to fulfil my engagement with her. . . . I suppose Mr. Haworth and Fanny have been to Beachamwell. . . . I shall expect to find a letter from you at Valkenswaard. . . . I wrote to Mr. Curtis a few days ago. . . . I expect we shall reach Valkenswaard on the 15th inst."†

Perhaps the most interesting fact that appears from this letter is Scales's marriage-engagement, for the "Betsy" above mentioned was his future wife, as will subsequently be seen, and to her he

* The following list of places will indicate the route taken:—Chamounix, Col de Balme, Martigny, Berne, Interlaken, Grindelwald, Schreidegg, Meyringen, Grimsel, Rhône Glacier, Furka, St. Gothard, Devil's Bridge, Altorf, Fluellen, Schwytz, Righi, Lucerne, Zurich.

† I cannot help supposing that this may not have been his first visit to Valkenswaard—the seat of Falconry in Holland. Few Englishmen who have been there succeed in spelling its name correctly, and hardly any one succeeds in doing so that has not been. Hamond was there again about the end of 1830 (*cf.* Trans. Norfolk and Norwich Nat. Soc. ii. p. 405, note). It may be observed that Mr. Salmon's journal shews that he also made a tour in Holland in 1825, but about a month earlier. Whether he went to Valkenswaard, or whether he and Scales were at that time acquainted, does not appear. It was not until 1828 that Salmon began his collection of eggs.

says he had already written from Geneva, with an account of his travels to that place, but the letter is not forthcoming, and some time was yet to pass before the wedding. Meanwhile it is clear that he continued to follow his customary pursuits. A letter from his uncle Haworth, dated Chelsea, November 23rd, 1826, speaks of executing a commission to a "maker of eyes"—obviously for bird-stuffing purposes,—and continues :—

"You mention very rare Birds indeed, as having recently occurred, and I think you are fortunate in having fallen in with some of them.*

"I do not think the birds hitherto found in the British Islands, so *comparatively* numerous as the Insects, although Insects are said to be less numerous in cold climates than in hot ones. We have about 300 species of British Birds, which is not near a *tenth* part of known Birds; but of Insects we have about 10,000 known to be British, and there are surely not more, if so many as 100,000 species known in the cabinets of Europe. And when I look upon the space of a large map of the world, I cannot think we have discovered half which are in existence."

Another letter, received the following year, seems worthy of being printed entire, from the interesting nature of its contents. The writer, as Mr. Frederick Bond has been good enough to send word through Mr. Edward Bidwell, was head-gardener and afterwards forester to Lord Fitzwilliam, first at Milton near Peterborough, and then at Wentworth-Woodhouse in Yorkshire, a friend and correspondent of Mr. Berkeley† and of Henry Doubleday. In Mr. Henderson's garden, there was a spring so arranged as to supply a small pond, round which he cultivated roots of the Bullrush; and, bringing home from the Fens larvæ of the large Copper Butterfly, he placed them among the plants so that they might there effect their final change, and sometimes there would be several of the perfect insects flying round the pond at once.

* What these may have been I do not know, nor is there, so far as I am aware, any likelihood of their being named: but one may conjecture that they would not be now deemed so highly.

† This venerable botanist has kindly informed me that when he first took Orders he lived for a time near Milton and frequently saw Mr. Henderson, whom he characterizes as an excellent naturalist. Mr. Henderson died some years since: had he lived he would have now been ninety years of age, or more.

"Milton, 28th August, 1827.

"Sir,—At this distance of time I fear you will have given up all hope of hearing from me in answer to the letter which I received with some insects about four years ago. The truth is I have from year to year been endeavouring to get as many specimens of *Dispar* as would be worth sending you; but until this year I have never been able to procure more than three or four. This year I have had more time and the insect has been more plentiful. I now send as many specimens of it as I can spare, with a few other things which I hope will prove acceptable. I have sent you three specimens of *Davus* which I had from a correspondent in Manchester, a few of *Paniscus* (which has been very scarce this year) *Pruni* and a few *Libellulæ*. Also *Machaon* and two specimens of *Arctia cenosa*. The others are for Mr. Younge, being those marked down by him when here. You are perhaps not acquainted with the fact that the larva of *Dispar* has been discovered, with the plant upon which it feeds, *Rumex aquaticus*. Last year the gardener from Ho[l]me Wood and a Mr. Wood of Huntingdon discovered the larva on the dock. They took a number of them home and succeeded in breeding a good many of the perfect insects. The gardener at Ho[l]me sent me some of the chrysalises (which are very curious, having much the appearance of some of the shells you find attached to the reed) to forward to Mr. Curtis who happened to be here at the time and took them with him for the purpose of having them figured. Standish has been in the Fens during all the *Dispar* season and has taken a great many but I do not think he has got anything new. The Fens are getting more dry, and the people are cutting more of the grass and sedge than they did some years ago, and it is probable that in a few years it will cease to be a habitat for those rare insects which have previously been found there. *Arctia cenosa* I have not heard of being taken, either larva or fly, this season. I am, Sir, your obt. servant,

J. Henderson."

The same year it would seem that the long desired opportunity had come, and in the following February (1828), Scales married at Stoke-Ferry, Elizabeth, the daughter of Mr. Charles Sanders of that place,* and thereupon took up his abode at Narborough. Two months later his father, Robert Scales, who had been for some years in failing health, died; but John Scales continued the management of the farm and warren at Beachamwell, until the lease having expired, he removed to Helhoughton, where he took a farm under Lord Charles Townshend. Thither he carried his

* Mrs. Scales's brother, James Bradfield Sanders, subsequently added to his name that of Bradfield on succeeding to the property of his maternal grandfather, and was a Justice of the Peace and Deputy-Lieutenant of Norfolk. He died May 15th, 1875, in his eightieth year.

collections of natural history; and during his occupancy continued to add to them, being aided therein by the exertions of his wife, until the collection of stuffed birds amounted to nearly two hundred specimens, while that of insects, which was begun, as has been already said, by his father, was considered by experts to be one of the largest in the kingdom. His collection of birds' eggs was likewise very important. In a letter addressed to Scales dated December 12th, 1831, Heysham remarks: "I had, I must confess, not the least idea that you possessed the most extensive collection of eggs of the British Birds hitherto formed in this country, as I am inclined to think from the list of your desiderata that it is equal if not superior to that of Mr. Yarrell of Ryder Street, London, who I always understood had the finest in England." Salmon, writing some years later to Lubbock,* designates the plan on which it was arranged as the best for a public museum; and writing, yet more than twenty years after that, to Wolley,† says that the first Great Auk's egg he ever saw was in Scales's possession, in 1828, being that which he obtained, as already stated, in Paris some eleven or twelve years before.

To the period of his residence at Narborough belong several letters that have been preserved. The first, dated "The College, Ely, 27 September," and apparently written in 1828, from Mr. George Helsham, afterwards of Woodbridge, but at that time completing his medical studies, and, as the letter shews, a young man of great promise.‡ In it he lays before Scales his troubles and doubts in determining the specific distinctions of Redpolls and Willow-Wrens—points which, though really long since set at rest, were at the time open to discussion, and even nowadays are

* This letter, dated August 16th, 1834, is inserted in his MS. Diary, now in the possession of the Norfolk and Norwich Museum.

† Letter dated April 9th, 1858, in my possession.

‡ After I formed this opinion, as none indeed could fail to do, from reading the letter, I was glad to find it confirmed by Freeman, the author of that to a naturalist most tantalizing work the 'Life of the Rev. William Kirby' (p. 66), wherein is contained a singularly interesting letter to Helsham from Kirby. Helsham died at Woodbridge, May 31st, 1836. His collections and papers passed into the possession of his brother-in-law, Mr. Jones, of that place, but I regret that after enquiry I have failed to get any further information as to his relations with Scales.

constantly perplexing the younger students of ornithology. Unfortunately the letter, though throughout expressing the writer's admiration for Scales, and stating the pleasure with which a commission to procure for him a set of dissecting instruments had been executed, does not contain matter of sufficient importance from a naturalist's point of view to justify the quotation here of any passages from it. A much longer letter from the same correspondent, dated at Woodbridge, April 6th, 1830, where and when he had by that time established himself in medical practice, on the recommendation, he says, of "my friend Mr. Kirby of entomological notoriety," is written in a similar spirit of gratitude to Scales, and is likewise full of ornithological gossip from which a few sentences may be quoted—the first indicating a change that has taken place in the avi-fauna of Norfolk, and the rest by no means devoid of interest:—

"Turtle-Doves are common here, not so in many parts of Norfolk. I shot one at Kelling last September—the first Girdlestone* had seen . . . A friend of mine at Ely last year put a nest of young Starlings in a cage, and allowed the parent birds to rear them. Their food principally consisted of great Dragon-flies, of which each young bird ate on an average 200 daily. No wonder they are big-bellied. I have been much disappointed at not getting more rarities this severe winter.† I am pretty well situated for Water-birds and Hawks. We have no Fieldfares, Redwings or Mountain-Finches in this neighbourhood, at which I wonder very much as the country is woody."

Then there comes a most characteristic letter from his old friend and associate Robert Hamond, written January 9th, 1831, at Hastings, where, attended by his sister, he was staying for the sake of his health, at that time rapidly breaking up.‡ After describing the medical treatment to which he was then subjected, and this in cheerful terms, he says:—

" . . . So you will see my time is well employed without the assistance of ornithology . . . With regard to ornithology, which is always uppermost in my thoughts, my man has killed four of the *Selninger* [*i.e.* Purple]

* For a notice of this naturalist see Trans. Norfolk and Norwich Nat. Soc. ii. p. 389.

† He names some of them in the former part of his letter, but an "Iceland Gull (young)" is the only one worth noting here.

‡ He died June 14th following.

Sandpipers, two Velvet drakes and one duck—which the people here call the Magpie or *Nightingale* Duck. He says there are a great many about four miles from the shore, and some very curious birds they call *French Geese*. By his description and his looking into Bewick I imagine they are the Northern Diver or Black-throated Diver, for he mentions their having long necks and long tails, and I fancy the latter may be their long legs and feet put out behind in their flight like the Heron. I imagine the weather must be severe in Russia and other parts for a great number of Waxen Chatterers have been shot, and I imagine the Velvet Duck must migrate many miles from hence. He also shot a pair of the Lesser Guillemots* quite different from those I got in the Orkneys. I have had my skins sent over† and have set many of them up in my leisure hours. I yesterday met with a bird which no one here knows what it is. I have been searching Bewick from end to side, and find none so near it as the female of the King Duck‡ . . . The Turnstone is not yet arrived, and not many Fowl but what come from Boulogne—Hares, Partridges &c. I really think there is a great variety of Fowl out at sea; but they are difficult to be obtained. I want information as to this *rara avis*, for I think it is a great wrinkle. I never knew the Eider to come so far south as this, and if it was a male Eider of the first year, I imagine the plumage would be more white with something like that lap[?] under the chin; but this has only the scapulars variegated, and no white bars on the wings, which would then have been the case. If I am tolerably well I shall perform on it to-morrow and send my man in search of more; but the expeditions on the sea are very hazardous and uncertain . . . I am to remain here till May, I am sorry to say. It is a long time to be banished, but trust in God it will be for my perfect restoration."

In the year 1842 Scales's tenancy at Hethoughton ended, and he then quitted Norfolk,§ never to return; but undertook the management of Lady Webster's property at Battle Abbey in Sussex, and, while in charge of it, caused to be planted the trees that now form the

* Under this name Bewick had figured the common Guillemot in winter plumage.

† Probably those he had obtained when on his recent visit to Holland.

‡ I omit the long description which follows, as being insufficient for determining the species. If, as is probable, the specimen still exists at Congham, it would no doubt be easily recognized.

§ On leaving Norfolk he disposed of part of his ornithological collection, and the magnificent pair of Bustards which he possessed were purchased by Mr. J. H. Gurney, who presented them to the Museum at Norwich, where they continue to be one of its chief glories (*cf.* Stevenson, B. Norf. ii., p. 32, and *infrà* App. C).

fine woods there, and are a leading feature of that part of the country. His stay at Battle was not, however, of long duration; for, in 1844, the Royal Agricultural College was founded at Cirencester, and on the 24th of December in that year Scales was unanimously elected its first Principal—the Council of the College, from whom he received the appointment, consisting of the leading agriculturists of the country. He forthwith entered with energy upon the duties of his office, among the first of which was that of delivering an introductory address to the supporters and students of the new institution. The notes of this address have survived the lamentable destruction that has swept away almost all the other documents illustrating his life, and shew that, as might have been expected, it was prepared with much pains; but they are hardly in a condition that would justify their reproduction here, even if the subject of them were sufficiently germane to the present occasion. It will be sufficient to state that it is plain that he entered upon his new career with a deep sense of the importance and responsibility of his position. After a rapid historical sketch of the progress of agriculture from early times, he came to the practical part of his theme, and dwelt forcibly—the experience of his own training adding strength to his words—on the necessity of a special education for those whose business it was to become cultivators of the soil, and to make the most of its products—vegetable or animal—and did not omit reference to the various foundations of similar character which already existed in almost every civilized country, for it must be remembered that the college at Cirencester was the first agricultural school that was established in England.*

In the very opening sentence of his address he uses the pregnant phrase "Science with Practice," that has become proverbial as indicating the method of modern agriculture; but one passage may be quoted in full:—

"Husbandry is an occupation of boundless variety, extending to more objects, and fettered by fewer positive regulations than any other. Not only do different systems prevail in different countries, but in different provinces of the same country. In some they are dictated by peculiarity of soil or climate, while in others they have

* The College was incorporated by Royal Charter granted by the Queen in Council, March 27th, 1845.

arisen out of local habit, or they spring from improvements that have not been generally disseminated, and even in the rudest districts there may be some which merit imitation. Now it is quite evident that some of these systems must be preferable to others, and that no man can determine which is best without being acquainted with all, nor can any farmer be said to be completely master of his business until he has attained that knowledge. It is not sufficient that he already gets what he considers a fair return for his capital and industry, if by other modes he could obtain more; and if he neglects them, he injures himself, his family, and the public. He may be satisfied with 30 bushels of wheat to the acre, but if, by any other method not more expensive, he could grow 31 bushels it is not only his interest but his duty also to adopt it. In no country has husbandry been carried to higher perfection than this; yet, even in England, practices exist in some counties that are either wholly unknown, or only imperfectly understood, in others, and it is only by comparing them that their relative usefulness can be ascertained. Farmers, being necessarily much confined to their own district, by the unremitting care which their business demands, can rarely inspect the system of any other, and therefore improvements that when made in manufactures are speedily promulgated in consequence of their usually close neighbourhood are slowly disseminated among husbandmen."

He concluded by urging especially the study of Chemistry and Botany, not only as assisting the farmer to discover the resources of the land and turning them to the best account, but because of the moral effects of those studies, and especially in the employment of leisure time. "Time is an estate," he quotes—"a truth strictly applicable to those who spend in a useful and improving manner that leisure which the vicious and ignorant spend in idleness."

There can be no doubt that his knowledge of Entomology, Botany, and Chemistry, added to his matured experience of agriculture, eminently fitted him for the post which he occupied, and to this many of his pupils subsequently bore willing testimony; but unhappily dissensions arose, how or of what kind it is needless here to consider, and he felt compelled, in justice to himself, after a time to resign the office of Principal, to the great regret, it is believed, of the majority of the Council. Early in 1852 he accepted the superintendence of the large estates of Castle

Townsend, near Skibbereen, in the south-west of Ireland, belonging to an absentee proprietor, and consisting of about 30,000 acres of land, a great part of which required reclaiming, draining, and planting. Here Scales continued nearly two years, when in consequence of the continued fall in the value of landed property in that part of the kingdom, coupled with the destruction of the mansion on the estate by fire, the owner could no longer afford to avail himself of Scales's services as agent. In 1856 he undertook the management of the estate of Castle Hyde, near Fermoy, on behalf of the mortgagees, who had advanced money upon it to the notorious John Sadleir, and remained there until it was sold in 1860. It was during his occupancy of this management that the present writer, through their common friend, the late Mr. John Salmon, entered into correspondence with Scales, being thereto induced by the belief that no one then living could furnish more information as to the causes which led to the extermination from Norfolk of the Bustard, and extracts from some of the letters written by Scales on this and other ornithological subjects will be found at the end of this memoir (Appendix C). Scales then resided for about two years in Fermoy, desirous of meeting with another agency, but, though his energy was still undiminished, his already advanced age seems to have hindered him from obtaining another engagement. Throughout the whole of his residence in Ireland, however, whether employed or not, he was constant in his pursuit of natural history, and was the same diligent collector of botanical and zoological specimens that he had been in England. Upon leaving Ireland, being uncertain as to where he should settle himself, he left the whole of his collections, together with his books, papers, furniture, and other household goods, in a warehouse at Cork. There they met with a disastrous fate, being, with the exception of a single cabinet (which contained little more than the duplicates of his oological collection *), wholly destroyed (as has been before mentioned) by an unfortunate fire; and thus the labours of a life—it may be said of two lives, since the collections had been begun by his father—wholly perished, a loss irreparable not only to the owner but to naturalists in general, for countless

* Kindly placed by Mr. R. H. Scales, after his father's death, in my hands. The most valuable specimen in it was a Bittern's egg marked with the date "1818," and most likely of Norfolk origin.

specimens—collected in the old times, ere agricultural improvements had banished or extirpated so many animals and plants, and therefore impossible to replace—were consumed.

From this time his active duties may be said to have ceased so far as a man of so much mental and bodily energy can become inactive. Shortly after his return to England, he and his wife took up their abode with their son at Clapham, and notwithstanding his age, he exercised himself in gardening work. In 1880 the son removed to Brighton, and thither he was accompanied by both his parents. In November of the following year Mrs. Scales died, being then in her eighty-first year; but Scales continued in the enjoyment of excellent health and, until within two days of his death, in the possession of all his faculties. The end came on the 25th of September, 1884, when he peacefully expired, having entered upon the second half of his ninety-first year. He was buried in the extramural cemetery at Brighton, in the same grave as his wife, and a stone, erected by their son, now marks the place where their remains rest. That these pages may form a not less lasting memorial of so persistent a worker in Natural History is the object with which they have been written.

APPENDIX A.

Letters to ROBERT SCALES from various Naturalists.

London. Sep^{r}. 30. 1810

My Dear Sir

After an absence of three months I am returned to Town and take an early opportunity in sending you what insects I have duplicates of; they are few indeed but as I go on arranging I shall reserve for you whatever I may have duplicates of. I have several Neuroptera for you but till I have made out their names they will be very useless. I have sent the insects for you to Mr. Jos^{h} Hooker. They are, 1 *Gyrinus Marinus* of Gyllenhall which is new to England, 2 *Dytiscus* 12-*pustulatus*, 3 *Ips piniperda*, 4 *Sigara minuta* 5 *Livia juncorum* of Latreille, 5 *Leptocerus interruptus* Leach, 6 *Elmis* —?, 7 the true *Dytiscus elegans* of Marsham's Ent. Brit. which is *D. depressus* Fabr. I must again regret that I have no more at present but when I have named all my Coleoptera I shall certainly have a great many more duplicates that you want. You was good enough

to give me a specimen of *Carabus clathratus* if you have any duplicates I shall be much obliged for another to compleat the pair, a female will be most acceptable but if you have not a duplicate female, a male will do as well as I can procure a female for it from a friend; should you be able to spare one be good enough to put it into a pill box lined with cork and well wrapped up in paper and send it to Mr. Josh Hooker directed to me who will forward it to me. I am very anxious about it as I have a pair of all the large *Carabi* except this. Present my best respects to Mrs. Scales and believe me to remain Yours truly

Wm Elford Leach.

I have just recollected that you very much wish to possess *Buprestis Salicis*, I will therefore give you one of mine; as I have two which were in Dr. Lettsome's cabinet which I purchased.

Pray excuse this scrawl.

'Robert Scales Esqr

To be left at Mr. Richardson's Druggist Norwich."

My dear Sir

I should have much sooner replied to your welcome letter of the 9th Sepr had I not waited to receive the box you were so good as to send me before I wrote. Having however never yet heard the smallest tiding of it, I cannot refrain any longer from writing to tell you so, & to beg that you will if possible make enquiry about it & if it have been sent give me the name of the vessel & other particulars that I may enquire about it here. I am quite eager to see the Insects you announce & should be extremely mortified if they were not to come to hand. I do not however give them up for the only parcel ever received by the same conveyance which was one sent me 2 or 3 years ago by Mr. Hooker was quite as long on its way & arrived safe at last. I cannot however understand how parcels should be so long on their way from Yarmouth to this place between which vessels can never be longer in sailing than a week or ten days. I shall take care of friend Burrell's* letter which I am very curious to see & return it along with as many of your desiderata as I am able to muster which I feel however will not be very many as you are so rich in most genera. Since I had the pleasure of your pop visit which I greatly regretted was not longer I have been very busy with the *theory* of Entomology but have done little or nothing at the practical department & have not found a single new Insect. Next summer when I hope to be relieved from the chain which now confines me to my study, I promise myself greater acquisitions & I shall set to work

* Apparently Mr J. Burrell author of a list of Norfolk Insects partly printed in the 'Transactions of the Entomological Society of London' in 1807 and 1809, vol. i. pp. 101-240, but unfortunately including only the *Coleoptera*.

collecting with renewed vigour after being so long kept from it. Mr. Watson * to whom I gave your message has been so lame all the summer that we have never been out together once. His leg is something better but yet far from well. He & Mrs. & Miss W. have been a tour to the sea coast towards Whitby & Stockton for a week lately which is the last he talks of making this summer.

Have you seen the review of the Entomological Soc^{y}'s Transactions part the 1st in the Monthly Review this month? They praise the plan & give credit to Mr. Haworth's paper with some little drawback, but say that it would have been better if the Society had not been in such a haste to publish.

We have had as delicious Harvest weather in this part as with you. Only one single heavy shower for these 2 months. Owing however to heavy dews & little wind much of the white corn is but just got in & I am told more stacks have been pulled down from being overheated in consequence of being put up damp than was ever known.

I heard from Mr. Kirby the other day. He had been spending a week at Halesworth with Dr. Hooker who of course you have heard is going to Ceylon in the spring.†

My wife joins me in best respects to Mrs. Scales & yourself & I am

My dear Sir

Yours most truly

WILLIAM SPENCE.

Drypool 11 Oct^{r} 1810.

"Mr. Rob^{t} Scales Halvergate Acle Norfolk."

MY DEAR SIR

Having just received the box of Insects you were so good as to send me, I write agreeably to your request to announce its arrival & to prevent your giving yourself unnecessary trouble in consequence of my last enquiring about it. I find that it has been some time arrived but owing to "*Drypool*" having been omitted in the direction was not brought to me. The insects were all in excellent condition & I return you my best thanks for them. *Carabus clathratus* is a most beautiful species which I am much pleased to possess; & the rest are all interesting to me. What I know about them I proceed to state.

The *Curculio on Sium* is quite new to me & evidently undescribed by Marsham nor can I find it in Paykull. This very distinct species we will as you suggest call *C. Sii* a name which I do not recollect to be preoccupied.

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* Most likely Mr. P. W. Watson of Cottingham near Hull, mentioned in two of the following letters and the author of 'Dendrologia Britannica.'

† *Cf.* Proc. Linn. Soc. 1865—66. pp. lxvi. lxvii.

The *Curc. on Butomus* is equally new to me & clearly undescribed in E. B.* I have little doubt that it is *C. atrirostris* of Paykull which he says inhabits aquatic plants & with whose description it very well agrees.

The *Donacia from the reed* is *Lept.*[*ura*] *simplex* E. B. a rare species which I never took myself & of which I possessed only one specimen given me by Mr. Kirby. As I perceive this does not stand among your desiderata I imagine you have some other species for it; but there is not the slightest difference between my specimen from Mr. K. & yours.

The *Donacia from Sparganium* is quite new to me & certainly undescribed by either Mr. Marsham or Fabricius. From *Lept. fasciata* the only species in E. B. with which it has affinity it is at once distinguished by its more thickly punctate thorax, silvery pilose abdomen & legs, & thighs without teeth. This interesting species we will call if you please *D. Sparganii* as there is already a *D. Equiseti* in Fab[ricius].

The *Capthirus on Iris in your marshes* I have never before seen nor can I find it described by Gyllenhal in his late Insecta Suecica who enumerates more species of this genus than Mr. Marsham, so that I have little doubt but it is altogether new. This being the case suppose we call it *C. Iridis.*

Ptinus testaceus & *Dermestes Typhæ* I had before the latter taken in the neighbourhood of Norwich. The *Papilio* is amongst my desiderata & one which I am very glad to have. When I get rid of my present labours & can begin to study Lepid[opter]a in good earnest I shall beg to make larger demands on your duplicate drawer.

Our friend Burrell's letter has amused me as much as any similar production could in the depression of spirits which I have not yet got over from the recent loss we have had the misfortune to sustain in the death of our youngest child, a sweet girl who though only 18 months old had all the intelligence & attractions of many children twice her age & whose loss has left a sad blank in our domestic comforts.

I will carefully return this paper when I have been able to look over my duplicates to see if I can repay you at all for your goodness which I hope will not be very long first.

My wife joins me in best respects to Mrs. Scales & yourself & I am

My dear Sir

Yours most truly

WILLIAM SPENCE.

Drypool 4 Novr 1819

"Mr. Scales Halvergate Acle Norfolk"

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* Marsham's 'Entomologia Britannica.'

NORWICH NOV. 27. 1810

DEAR SIR,

I am very sorry I was out when you called. The parcel you leave for Kirby I take the liberty of opening as I suppose it contains the Apions. I wish to look them over before I go to Kirby's, that I may spare him some *time*, an article at present most valuable to him. My Apions are all named *by him*. Therefore the names I may affix to your more easily made out Apions will still be authentic, as I shall take all to Barham of which I am *at all uncertain*. I send you the list of Pairs in Mus. tuo; which are desid: to me & for which I wish to offer exchanges. I have left opposite to each column of names, another in which can be inserted the Insects you may consent to receive in return.

I would thank you to send me immediately your list of Desiderata.

I remain yours very truly

SIMON WILKIN.

Rob[t] Scales Esq[r] Halvergate near Acle.

NORWICH DEC[R] 22. 1810.

MY DEAR SIR

After unavoidable delay from various causes, the Norwich Ent. Soc[y] have finally resolved to alter their January meeting to the 27th Dec[r] as at the usual time (1st Jan[y]) first Tuesday in y[e] month I shall be in town.

They will meet at Thorpe, the house of my brother in law Mr. Brightwell, who is one of our number. The Soc[y] beg the favor of your company and my brother, not having the pleasure of your acquaintance, begs *me* to say *for him*, that he will be very happy to give you a bed at his house.

I am at present with him, as Mr. Kinghorn, the gent: with whom I live, is from home. The Apions I have opened as I said before, to save Mr. Kirby *time* & *examination*. I send you a list of them with names. Those I am in doubt about stand with ?. Those without names, & the ?s, shall undergo Kirbyan inspection. The others I am *certain about*. The Society would feel obliged by a communication of captures you have made in Norfolk; together with when, & where taken: as they regularly journalize all Norfolk Insects. If any circumstances offer which you feel disposed to put into the form of a *Paper*, the Soc[y] would be happy to profit by your observations on their favourite Science.

I am my dear Sir

Yours very truly

SIMON WILKIN.

Just remembered to beg you to come *in the morning* of Dec[r] 27. That we may *con*: over my Coleoptera, which are at Thorp e . The exchanges we talked about are best arranged when we are *alone*, & the Insects are before us. I expect when in Town to purchase a *lot* of Insects, therefore wish to reserve final decision till I return as I may get some of the thing s I

marked in your Cabinet. But we will draw up a list with two columns, one the Insects I beg of you & the other what you *agree to accept* in exchange & then we shall work in *daylight*. And if any Insects are in the London parcel which I purchase, we can strike out the names in our list.

P.S. When I read over the above I am out of temper with what I say about the "lot" & "parcel" of Insects to be purchased. In our present circumstances it is more fair to say that I am going to London with Mr. Kirby to look over & treat for the purchase of no other, & no less, than the Foreign & British Collection of R. Francillon, Esq^{r} Norfolk St. Strand! But I beg you will not mention this to any one till I return Only N. E. S. & Kirby & Francillon know of it. I must again sign this vast Postscript with S. WILKIN

Apiones ex mus. D. Scales—

Where there were three specimens of desiderata to me I have taken them as I know Kirby wants but one of those he described.

[List follows with the determination more or less provisional of 59 out of 68 specimens.]

"Mr. Scales Halvergate"

BARHAM MAY 3: 1811.

DEAR SIR

I owe you many apologies for having so long detained your Apions. The truth is my time is so fully occupied in preparing the Introduction to Entomology that Mr. Spence & I have jointly undertaken, that I have little leisure to look over insects. I have at this time by me a box of Mr. J. Hooker's & another of Mr. Leach's which I have had longer than yours. At this time I don't know what duplicates I have, but I hope one day to have more leisure to look them over—when I shall be happy to fill up any of your gaps—I have however sent you a specimen of my fine *Apion Limonii: Curc.*[*ulio*] *Sii* I have from Mr. Leach. Shall be happy to possess *C. atrirostris* also the tuberculated one you mention having found on *Equisetum*. Many thanks for the *Leptura*, & for your kind intention to give me *Car:*[*abus*] *clathratus* when you meet with another. Shall be happy to give you a look when I come into Norfolk, & should you travel this way to shew my collection to you. On the other side are the names of your Apions—& am Dear Sir

Yrs. very truly WM: KIRBY.

[List follows headed "Mr. Scales's Apions"—being the determination of 68 specimens.*]

"—Scales, Esq^{r}:"

[* No. 66 is "Apion genistæ Append." of which Kirby says (Trans. Linn. Soc. vol. x. p. 347) "*Habitat* in Angliæ *Genistâ tinctoriâ*. Dom. Scales. Mus. Dom. Marsham, Milne, Scales, Spence, Geo. Sowerby, nostr."]

[undated]

My dear Sir

I duly received yours of the 28th ult. The business of publication at the latter end of the month has prevented my answering it sooner. I however take the first opportunity of doing so.

My Father says he feels highly pleased that you think on him when anything turns out in his way, and anticipates the pleasure of having something to keep for your sake in his museum. He is particularly anxious about fossils and petrifactions found in Clay and does not mind expence of carriage, so never stand for that, but send him the horn or tooth and also some variety of the oyster shells and whelks, and any other shells that may be found, also some specimens of the red earth and specimens of the earths found above and below and that in which the horn is found. Some he has lately got from the digging of the Tunnel where there has been found a fossil rezin, very curious. He begs his best remembrances and is thankful for your kind invitation and will be happy to see you & any of your family in London.

I would write to you more fully, but business prevents & I intend to send you a long letter, either before or on the receipt of this very curious fossil horn.

In the meantime believe me

My dear Friend

Most truly yours

[No address no post mark.] G. B. Sowerby.

Though this letter is undated I do not hesitate to place it before the next, since the "horn or tooth" of the one seems to be the "bone" of the other. The Tunnel mentioned is probably that which was attempted to be made under the Thames in 1804 and the following years. Brunel's Tunnel (now existing) was not begun till 1825.]

My dear Sir

I am very grateful for your sending me the bone, which may be possibly one of the spinal bones of the neck vertebræ of the Mammoth. I should think must or may have been found with other remains. Pray let me bribe the men to take care of everything, shells &c that they may find—one penny for a shell—twopence for a tooth and in proportion for a bone, horn, &c. will probably prevent them throwing them away, and if they should find anything I would beg warehouse room till you shall find it convenient to send.

One of the specimens was almost pure but gritty micaceous brown ochre like the Roman ochre of Painters. The other was a mixture of clayey loam and soil.

I am glad to find all well and shall perhaps witness it in a call, if not

myself, some of the family, when we may be least expected to leave home. All join me in best remembrances to yourself Mrs. S. & family & I remain

My dear Sir,

2 Mead Place, Lambeth
June 10. 1811.

Most thankfully yours
JAS. SOWERBY.

[On same sheet of paper.]

MY DEAR FRIEND

You will on the other side find my Father's acknowledgement of your kind present of a bone, it will serve him & the Antiquarian Zoologists to pick for some time, & will not soon be forgotten by your humble servant. It is very curious.

I wish I had some news to tell you, but I am now so much out of the way of Entomologists that I have none in that way. It is indeed true that I am married and I am very comfortably situated. Many thanks for your kind wishes. May you & yours live long & enjoy the most uninterrupted felicity.

It has been a source of particular pleasure to myself & all my friends who have seen your letter to hear that you & family are well. Mr. Fenton desired to be kindly remembered to you as well as Mrs. Moreton. They are well and set off a few days ago for Southend where they are to spend a few weeks. Mr. Milne & Mr. Neale are also well.

I have not made many acquisitions to my Cabinet lately—the singular insect that inhabits the Bat in the same way as the *Hippobosca ovina* does the Sheep is the greatest. 'tis called *Nycteribia vespertilionum*. Standish has bred male and female Glory of Kent, but both cripples. He has also bred the small pale Brindled Beauty—his Lobsters are dead. A new insect has been found lately in America which in the larva state feeds in the abdomen of the Wasp in a similar way to what the *Stylops* does in the body of the Bees in England.

My Wife joins me and all friends in best respects to yourself, Mrs. S. & Family & I am

My Dear Friend

Mr. Robert Scales
Halvergate near Acle
Norfolk.

Most sincerely
G. B. SOWERBY.

MY DEAR SIR,

I embrace the earliest opportunity to render you my warmest thanks for your kind present of Insects, all of which except *Cur*[*culio*] *atrirostris* of Paykull were new to me, of that I had one specimen but had not examined it, until I received yours. I have no doubt that it is what you have named it, having compared it with Paykulls description. I am sorry that I had not your desiderata a few months sooner,

having lately supplied another friend with 100 specimens that he was in want of & also a parcel for the Wernerian Society at Edinburgh. I will however as soon as I have leisure not only examine what remains but will also ransack the duplicates of another friend & neighbour as soon as he returns to town. I have shewed the list to Mr. Milne & am making out a copy for him as he thinks he can do something Poor M^r Leay has been in a very unfavourable state of health for some time & is at length gone down to Caithness his native air, in the most remote part of Scotland, where, if he finds benefit he will stay 3 Months. I will take care of the Insects for him. As to myself my time is so completely occupied that I can spare but little to my favorite science, and indeed this year appears to have been a blank with all my Entomological friends, not one having been successful. I am much pleased that a lover of the Science has become a farmer, for I am very sure that you will be able to discover the various enemies to corn, cattle &c &c and perhaps be able to prevent much devastation, by studying the oeconomy of many destructive species of Insects, which I hope you will attend to as much as leisure from your more necessary occupations will permit, the being constantly in the fields will give you many opportunities of viewing them in their different states & habits & enable you to determine many doubtful points.

I shall be happy at all times to correspond with you, & to give as well as receive any information that may tend to improvement in our studies, and sincerely wishing you every success in your most essential employment as well as in your amusement—

I remain

West India Dock House
Billiter Square
24th Aug^t 1811.

Dear Sir
Your most obed^t serv^t
Thos. Marsham.

"Mr. Scales, Halvergate near Acle Norfolk."

[undated]

Dear Sir

In a box I am sending to Mr. Wilkin I inclose this note to thank you for your goodness in setting aside for me *Carabus clathratus*. I send a new *Silpha* called *S. Curtisi* after Curtis of Norwich who discovered it; also *Papilio Artaxerxes* ♂ et ♀ which I take for granted you do not possess. I shall attend to your list as soon as I am again settled. My time is now much occupied by the study of Mineralogy so that I have scarcely time to attend to Entomology as I could wish. with best respects to Mrs. Scales I remain yours very truly

W^m Elford Leach.

"R. Scales Esq^re"

[This is evidently the letter which Wilkin opened by mistake as mentioned by him in his letter which follows.]

My dear Sir,

Many, many apologies for my unintentional rudeness in opening the inclosed note from Leach to you. The fact was I had rather eagerly waited for the packet which inclosed it, and seeing no other letter, supposed it was for me & instantly opened it. Likewise many apologies for so long detaining it & your insects. Leach has repeatedly teized me about *Carabus clathratus* fem: promised him by you, and which he supposed was committed to me; I have therefore sent him my ♀, trusting to you for another, which I doubt not you will let me have as soon as convenient.

When will you come and see me? I shall be at home all next week except Monday 27 inst. and shall be very glad to see you

Respects to Family

Yours truly
S. Wilkin

Cossey Jan 20. 1812
R. Scales Esqr Halvergate

My dear Sir,

What an age it is since I have had the pleasure of hearing from you! & I have had such short notice of the opportunity by which I send this & am besides just now so overhead & ears in the East India Business as you will see by the inclosed Report that I have not time to say half I am desirous of saying.

For the last six months I have been so incessantly engaged with one thing or another that I have not had a moment for Entomology. First came the Botanic Garden of which you will find the history in the inclosed pamphlet I need say no more than that it goes on most prosperously. Next came my inquiries into Fingers and Toes which I pledged myself to make for the Holderness Agricultural Society of which I am a member & which what with personal applications & correspondence took up no little time. A dish of these I inclose & I shall be obliged by the useful comments & information which I know you can give. Lastly came a negociation with Mr. Watt for the sale of my 93 acres of land at Bp Burton to which his squireship had taken a huge fancy & for which he offered me £9000, but tho' the course seemed very clear when £2000 was offered more than any one else would have given, I had necessarily a good deal of inquiry to make into the value of land & before I at length closed with him.

Just when all these matters were off my shoulders came this East India Business so that I have literally collected but very few Insects this last summer a *Curculio* on watercress (*C. nasturii* of me) of which I have sent you a specimen to Mr. Wilkin.

Mr. Watson is in good cue & very busy in *picking* Persoon* for the Garden, which we have already filled with trees and plants from the sale of Phillipson's nursery.

I shall be in Suffolk in June & hope we may one way or other have the pleasure of meeting. My wife and daughter accompany me in about six weeks to London & thence I shall go to Barham.

My best thanks for Mr. Burrell's pamphlet which I return herewith. Pray remember me to this worthy Gent. when you see him. My compts. to Mrs. Scales & I am my dear Sir

Yours truly

Drypool 16 Apl. 1812 WILLIAM SPENCE.

"Mr. Scales"

COSSEY NR. NORWICH
23 OCTR 1812

MY DEAR SIR,

I deferred answering your letter which I had the pleasure of receiving many months ago, in the hope that on my arrival in this quarter of the world I should have been able either to accept your kind invitation of spending a few days with you, or at all events of having it in my power to give you a call & have a dish of Entomological gossip with you. I am truly grieved however that both one hope & the other have been disappointed having been so closely engaged with Mr. Kirby on our *opus magnum* ever since my arrival in Suffolk that it was not until very lately that I was able to fulfil a promise long ago made to Hooker of spending a short time with him: & finding to my great mortification on my arrival there that you had already quitted Halvergate & gone to a distant part of the county where, my time being limited to a day or two, I cannot have the pleasure of hunting you out. In fact Hooker though aware of your having left Halvergate did not know precisely your address, & I am obliged to send this to his brother at Norwich for a direction. My wife would have been very happy to have accepted Mrs. Scales's polite invitation but our little girl though otherwise in excellent health is made so ill with coach travelling that I was obliged to leave them both in London where they are staying with a relation until I return to convey them home.

Your late vast extension of your farming concerns of which as being doubtless greatly to your interest I was very glad to hear, will of course preclude much attention to Entomology. Your zeal however I am well convinced will not suffer your new abode to be unexamined & I greatly flatter myself that your acute remarks will present us with as attractive a

* Persoon was a well-known botanist. I imagine Mr. Spence to have meant that from a study of his works Mr. Watson was picking out plants that would be suitable for the new Botanic Garden.

dish of novelties as you found at your old one. For my part I have done nothing in collecting this age all my time having been engaged in preparing our work for the press which we are about setting to work printing forthwith.

From a letter I received from friend P. W. W[atson] the other day I am glad to find that Mr. Haworth is safely arrived with all treasures at Cottingham. P. W. himself tells me he is now quite a furioso in Cryptogamic Botany & has been hunting Ferns at Flambro, Lichens at Selby &c &c.

I stay here till Saturday & shall spend Sunday at Mr. Hooker Senior's Norwich having taken my place for Ipswich for Monday. If any chance should fortunately before then bring you to Norwich I hope you will not fail to give me a call.

I beg my best respects to Mrs. Scales & am

My Dear Sir in haste,

Yours very truly

William Spence.

If you have any new facts about Fingers & Toes pray favor me with them. Wilkin begs his remembrance.

"Mr Scales—"

2 Mead Place
Lambeth
June 2nd 1819

Mr. John Scales dated
Monday morns 30 June *

My Dear Friends

I recd. the Parcell and Letter but too late for yesterdays post being while the postman was ringing his bell near 6 o'clock and could not possibly get a letter ready.

The Goosberry blight or *Æcidium grossulariæ* speaks for the remarkable change in the season. It is best or safest perhaps to call it as I now do, although it resembles *Æm Corni* E. Fungi † 397 fig 3. or *Æm Berberidis* 397 fig 5, either in a younger state than I have figured them have more of the orange coloured base. Thus a change of season for a few hours has had

* This singular memorandum is somewhat confusing. "30 June" is of course a mistake; but the 30th of May, which is most likely meant, fell in 1819 on a Sunday! It, however, seems to record the receipt of a letter from John Scales to which that here printed is in reply, and thereupon the communication to the 'Norfolk Chronicle' (reprinted App. B) was written. Mr. R. H. Scales informs me that the cutting containing the latter was folded in this very letter, thereby proving the connexion of the two.

† 'English Fungi,' one of James Sowerby's numerous works.

the effect of autumn and unfortunately interrupted the promising expectation of a continued summer. Similar interruption in growth &c has happened in the Chelsea garden and the contrast of cold winds and rather copious rains has interrupted the vigour of the more perfect plants, and parasites have got the advantage of their weakness. I thank you for your continued kindnesses and fear I shall always be in your debt.

Blight and parasitical Fungi are often attended by the *Aphidæ* and they prove food for the *Coccinellæ*. It often happens in the hop-countries.

I am glad if the book is usefull and you like it—will make out my desiderata of Insects if I get opportunity, but should duplicates occur that can be spared many may be usefull to me, who am with best wishes for all, yours dear Sir very faithfully

JAMES SOWERBY.

Could like to indulge myself to come and look at you but at present am too much interrupted. My son George has been very busy I believe.

"R. Scales Esqr Beachamwell Norfolk"

APPENDIX B.

LETTER FROM JOHN SCALES TO THE EDITOR OF 'THE NORFOLK CHRONICLE.'*

SIR,

As the late unusual and curious spotted appearance of the Gooseberries and their leaves seems to have created much surprise to persons in general, who are unacquainted with the cause, and who attributed it to those harmless but industrious little insects the Lady Birds, (Coccinellæ of Linnæus), I have been induced to offer a few remarks upon it, and the real object and pursuit of those Lady Birds, which should you consider worth an insertion in your widely-circulated paper, I shall feel truly obliged. These little creatures, instead of committing mischief upon our fruit trees and bushes, are busily employed, creeping in every direction upon them, in search of those pernicious and destructive imparasitical aphides, or leaf-lice as they are generally called; insects as singular in their habits and manners, as they are obnoxious to mankind.

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* I have taken the liberty of correcting two or three obvious misprints in the letter as it appeared in the newspaper of June 26th, 1819. With this should be read the letter from James Sowerby of June 2nd, 1819, printed above (App. A).

My father's gardener, amongst many others, enquired if I did not think the red spotted appearance was to be attributed to the astonishing number of Lady Birds, so prevalent in almost every garden in the neighbourhood; that such being his opinion, he had ordered his family to destroy all they could find in his garden: I soon undeceived the cruel man, by plucking a plum-leaf curled up by these aphides, and placing two or three Lady Birds upon it; they soon cleared the leaf by devouring these aphides before his eyes; and he greatly astonished, hastened home, and checked the destructive hands of his family.

Your readers have no doubt also observed on the currant bushes, and some of the trees, an unusual quantity of honey-dew, as it is generally termed: and of which, so erroneously supposed to fall from above, I shall endeavour to point out and explain the real nature and cause. In its first state it is a limpid, glutinous, and transparent fluid, much resembling gum found occasionally upon cherry trees, which these aphides have the means of emitting in little globules, from a setiform tube, and five or six small apertures on each side of the body, and by jerking these little globules off their bodies, they cause them to fall on the leaves below, and dissolving by the natural dew of night, incorporate, and spread over the leaf in the manner of a varnish as we see when dry. The above curious fluid, little inferior to honey, is of infinite service to bees and ants, which sip the nectareous juice with avidity, and the manner in which these creatures discharge it may be observed with a powerful magnifying lens, and more particularly by the species which infest the honeysuckle. Many other insects possess the same faculty of discharging a glutinous fluid; for instance, an insect called Cochineal, and also a tribe of insects called Coccus, whose gluten is more resinous, and which have at various times committed so much damage to the fruit trees in the nurseries around London. I shall endeavour further to prove, that certain species of these insects alone are the cause, and have the power of imparting that sweet taste which this dew or varnish possesses, being endowed with a tube or syphon, which they insert into the sap vessels of the plants, upon which they are found, and by abstracting the nutriment of the plant, stagnation in the part ensues, and causes the leaves to curl up in the manner we see them; and also by observing, that the honey-dew is found upon no plants but those which contain these aphides, consequently had it been simply a natural but uncommon dew, every species of vegetation must have been affected alike.

Observing, with the greatest concern, the Pea Crop is likely to be affected, in a greater or less degree, by a species of this tribe of insects (Aphis Pisi) of which there are no less than forty-five indigenous species, and as great numbers of these aphides, or pea-lice, and Lady Birds, have been supposed by persons ignorant of the cause, to come over by easterly winds, I shall proceed to prove the absurdity and fallacy of those ideas, and to account for the multitude of them, at particular seasons, in a more natural manner, by attributing it to the incredible faculty of rapid propagation which they

possess, as far as my knowledge of them will permit. A moment's reflection must convince us that it is impossible for them to arrive here with an easterly wind (alluding to the aphides)f rom two reasons, viz., on their first appearance here they are just excluded from the egg in an imperfect or larva state, and have no wings to enable them to fly, and those we generally observe are females, the males being very few in proportion, and are seldom found till Midsummer; and supposing they had wings, the myriads which attack our peas, during the season, would almost cloud the atmosphere, and strike our faces in their approach: but as their history, and most wonderful powers of fecundation, told us by Reaumur, may not be uninteresting to your readers, I shall beg to insert it. He informs us, "That at one time they are oviparous, at another viviparous, and that the sexual intercourse of one original pair serves for all the generations which proceed from a female of a succeeding year. He has also proved that one aphis may be the progenitor of 5,904,900,000 descendants, and it is supposed that in one year there may be 20 generations." If a young one be taken immediately upon exclusion from the mother, and kept apart, it will produce young, which young, if also kept apart, will likewise produce, and so on, without the presence of a male. About Midsummer, however, this singular fructification begins to lose its wonderful effects; the aphides cease to breed females only, males are likewise produced, which immediately celebrate the nuptial rite, and communicate fertility to the whole female posterity of a future summer. Can we wonder then at the rapid increase of them, which are daily observed on the peas during the summer in which they are affected?

The spotted appearance of the Gooseberries alluded to in the first part of this Letter, is caused by a parasitical plant called Æcidium Grossulariæ, which like all other fungous parasites, when arrived at maturity, the pollen or dust observable in the shields, is wafted by the least breath of wind in every direction, and when it meets with a plant whose sap is favourable to its growth, it there fixes, and from a mere speck at first, increases and spreads rapidly, and when it has attained its perfection is again dispersed upon its neighbours. There are probably many shrubs favorable to this parasite.

Should I, by the above observations, be the instrumental cause of befriending those harmless creatures, the Lady Birds, and of rendering any information to your readers, I shall, with pleasure, subscribe myself,

Your obedient Servant,

JOHN SCALES.

Beachamwell, near Swaffham,
June 14th, 1819.

APPENDIX C.

Extracts from Letters from JOHN SCALES to the writer of this Memoir.*

Skibbereen, Dec. 15. 1855

. . . I will endeavour to answer all the enquiries in your note as far as I can. I must first state that my father occupied the warren at Beachamwell at the time the old male Bustard came into my possession which was found in a sitting posture by the warreners, who were attracted to the spot by some Crows. They had picked out the eye which lay uppermost on the ground. It appeared to have been dead two or three days at least. Having been shot in the lower part of the body, the skin became putrid, and in skinning it I had to remove a large piece. This, together with the eye being so much injured, compelled me to set it up in the attitude you may have seen in the Norwich Museum.

The reason why I believed it to have been shot by a Mr. R. Sanders was that when I subsequently became acquainted with his father, the late Mr. Sanders of Stoke Ferry, I accidentally heard that his son Robert, then a youth from school, when on a visit† at Narborough, had shot at and wounded a very large bird, which his friends told him was a Bustard, and as it was stated that it flew towards Marham Smee (a tract of land of considerable extent between our warren and the great coursing field at Narborough, and when in crop of turnips a favourite resort of the birds) I came to the conclusion that it must have been shot by him, and the bird alluded to when found on our warren. The youth being on a visit about harvest-time would seem to confirm it, as, to the best of my recollection, that was about the time it was found, and its becoming putrid so soon, tends to confirm it; but as it was only stated by a mere youth and thirty years ago, I am afraid you could not place sufficient dependence upon the information . . . for, after all, it might not have been a Bustard; although I have always thought that my bird was the one he shot at; but I fear it is

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* It will be seen that the letters from which these extracts are taken were written *currente calamo*, and possibly without revision; but, except to make a few obvious corrections, I have thought it best not to attempt to recast the sentences, but leave them in their original roughness. I may also add that, fully recognizing the authority with which Mr. Scales was entitled to speak in regard to the Bustard as a Norfolk bird, I am inclined to think that on some points he was, perhaps through the lapse of memory, after so many years, not altogether correct, though his views seem in every way worthy to be placed on record.—A. N.

† "To Mr. Long"—Scales to Salmon *ut infra*.—A.N.

impossible to ascertain the precise year in which the bird came into my possession. It must have been between 1815 and 1818, as I became acquainted with the Rev. R. Hamond about 1816 or 1817, and I had obtained it before that time. Possibly Mr. R. Sanders might recollect the precise year he was on a visit to Narbro'. He is a solicitor in London and his chambers are at No. 1 New Inn, Strand. Mr. Hamond had a female and young one in his possession when I became acquainted with him, which he told me were killed (at least the female) some years previous, and form part of the group in his case. I also recollect his having shewn me two or three eggs at the same time. They were found in a field of green rye either at Massingham or Walton field, which adjoins Massingham and Westacre—Westacre High House being the then residence of Mr. Hamond. I believe he obtained one or two eggs subsequently . . . as he gave one to me, and neither his nor mine have any marks or date upon them—not supposing this noble species . . . would become extinct so soon. . . . With respect to the other two birds in Mr. Hamond's case . . . the noble and magnificent male and the other female . . . and also the female in the case I sold to Mr. Gurney, which you state to be now in the Norwich Museum, I fear I cannot give you a correct date as to the precise year in which they were killed. I became acquainted with Mr. Hamond in 1817. In 1820 I accompanied a relation of his to the Continent. In 1822 Mr. Hamond, Mr. Caldwell of Hillborough and myself went to the Continent together, and in 1825 I went to Germany and Switzerland on a visit to a friend—so that those three birds must have been killed during one of those intervals; because I not only assisted in preserving them but assisted Mr. Hamond in setting up the male and female, having previously taught him the art of skinning, preserving and setting up birds—and from circumstances which have just come to my recollection I am certain they were killed in 1818 or 1819.* . . . I will describe as well as I can recollect how they were respectively killed, although I am aware it may be a repetition of what I wrote to Mr. Salmon.† The females were caught by rabbit-traps amongst white turnips in a large field in Westacre‡ parish.

* A memorandum in Mr. Hamond's handwriting on a plate of these specimens seen by Mr. Stevenson (B. Norf. ii. p. 34, note) fixes the year as 1820.—A.N.

† Mr. Salmon sent me this letter written in the preceding June. Not only is the account therein given not so full on the whole as that which I quote here, but from Mr. Scales having had more time to consider the subject I think his later version the more trustworthy, though in no case are the discrepancies of any importance. A very few points mentioned in the earlier version have been omitted in the later. These I here insert in the notes.—A. N.

‡ "I set about 4 dozen rabbit-traps amongst the Turnips in Westacre field, and we drove them [the Bustards] there."—Scales to Salmon *ut supra*.—A.N.

The one in Mr. Hamond's case was caught first, the second female caught was the one in my case; but I will not be positive they were both caught the same day, although it is my impression they were—at any rate it must have been within a day or two; the traps belonged to my father, and neither they nor the warrener to attend them could be spared longer. There were from fifteen to twenty [birds] in the flock, and they became very shy and would not then alight amongst the turnips; but when disturbed from Marham Smee, adjoining our warren, flew across to Massingham heath. In so doing we observed they generally passed over a long narrow belt of gorse in Narford field, flying low. Therefore Mr. Hamond determined to conceal himself in it, and try to shoot the male bird which he was so anxious to procure. I think the first one he shot was the splendid female I have in my collection at present.* He then succeeded in bringing down the noble fellow, which I think was on the following morning early; but as this occurred thirty-five or thirty-six years ago, I cannot charge my memory with positive accuracy. I assure you he was delighted enough. At any rate they were all killed within a week or ten days of each other, and although I cannot state the precise month, it must have been the latter end of 1818—say October or November, or January or February in 1819—although I am inclined to think it was the latter, as I have an indistinct recollection that it was during the busy season of rabbit-killing. You will therefore please to bear in mind that the first female and young one† in Mr. Hamond's case were killed at Massingham before 1815, the second female at Westacre in 1818 or 1819, and the male bird at the [same] period but in the parish of Narford.

The male bird formerly in my collection and now in the Norwich Museum was found on our Beachamwell Warren between 1814 and 1817; the female in the same case was trapped in a turnip-field in Westacre parish . . . with Mr. Hamond's (1818 or 1819) and the female I now possess was shot in the parish of Narford at the same period as Mr. Hamond's male. I really am very sorry I cannot furnish you with data more correct or satisfactory.

Prior to (say) 1812 Bustards bred annually in the large fields or "brecks" in the parishes of Massingham, Walton, Westacre, Narford and Narborough which adjoined each other, amongst the green rye, which, at that time being sown broadcast, there was nothing likely to occur to molest the birds; but when the improved system of drill-husbandry came into operation, and consequently the rye, wheat or oats [were] hoed between the drills, the birds became disturbed, and we may reasonably suppose the eggs were taken. Therefore the birds have progressively retired from the district and, being of such great size, became objects of great attraction and ambition to the

* Since burnt with the rest of the collection (*suprà* p. 96).—A. N.

† Miss Sarah Hamond, however, told me in 1856 that this young bird had been hatched out under a common hen, and had died.—A.N.

sportsman and gunner, so that the male at all events, I believe, has become extinct. I observed a fine male in the British Museum the other day, but no female. Of course I know nothing of the history of it.* . . . When the late Dr. Leach was . . . at the Museum I was intimate with him, say thirty years ago, and I recollect there was a very miserable male specimen, which I have no doubt was a British one. I cannot think this is the same. I saw a miserable male specimen in the University Museum as I passed through Dublin about two years ago; but did not observe it, on looking hastily through the Museum, as I passed through the other day. I have understood that a male bird was killed in the Bog of Allen some years ago; but whether that in the Dublin Museum is it or not I do not know. There is no female in the Dublin Museum, so that I think mine is the only female specimen in Ireland. I observed two Bustard's eggs in the British Museum; but no figures or marks upon them. A friend of mine, Mr. D'Urban Blyth of Massingham, had a Bustard's egg about ten or fifteen years ago,† found in a field of rye on his farm, as I was informed. This is all the information I can give you about the Bustards' eggs.

With regard to the Bustard being polygamous, I am inclined to think there is very little doubt of it. In fact that is the opinion I had formed. In the various flocks, both large and small, I have never observed more than two or three males, and I perfectly well recollect that when Mr. Hamond shot his fine male, there were only two males out of fifteen or seventeen birds. I have seen as many as twenty-one, but never more than two or three males. I have never seen the males with any females about the time of incubation, and my opinion is that, during that time, the male bird was the sentinel to, probably, two or three females, acting as a decoy to draw off the attention of the intruder.

I think the question may be asked, are they, the females in particular, migratory? It is a common circumstance for cottagers' and even farmers' wives to send a female Turkey to the male at a distance, and [she] having been impregnated is brought back and found to be sufficient for the clutch of eggs. Now how far may this apply to the Bustards, supposing them to be plentiful in the great plains of France, and, when the females are impregnated, [to] retire from the males and some to migrate to England. Otherwise, how can we account for a solitary female continuing to be seen occasionally, and I have seen an account, once or twice, of an egg having been found in an open wheat, rye, or oat field. . . . I have merely thrown out these observations for your consideration. . . . I recollect perfectly well when a young boy, about ten years old, going with my father to Mr. Donovan's,

* This specimen came from Montagu's collection and is said to have been obtained in Wiltshire.—A.N.

† Through the kind intervention of Mr. T. Southwell what I believe to be this specimen passed in 1857 into the collection of my brother and myself.—A.N.

at that time a great naturalist (who published his work on Insects and others on Natural History) who had three Bustards in one case, for which he asked fifty guineas! What became of them subsequently I know not, having then gone to boarding-school. . . .

In reference to the gular pouch said to be attached to the throat of the male bird, I can distinctly state that in my own specimen I dissected out the pouch; but from [its] having lain dead in the atmosphere upon the warren for two or three days, or perhaps longer, as I stated before, in the hottest part of summer, the throat in a greater or less degree had become tainted, so much so, that some few of the auditory feathers or auriculars sloughed off; otherwise I had intended to have expanded it and preserved it. This circumstance I perfectly recollect, but as regards Mr. Hamond's male bird I can say nothing as I recollect he had skinned it before I arrived at High House; but I assisted him to set up the bird. The pouch was not thought of, or, if it was, I do not recollect his having mentioned it. The body was cooked, and proved excellent eating, as did also my own. Those were the only two males I ever skinned.* . . . I feel a deep and lively interest in the subject you have taken up, [so] that it affords me the greatest pleasure to contribute the best information in my power to elucidate any of the points you are so anxious to have cleared up. Therefore the anxiety and interest I feel has caused me to carry them out to an unpardonable length, and I can only throw myself upon your kind indulgence to excuse it. You must cull out the few observations which may be useful, and throw the trash away. . . . I think it probable that the males until they arrive at a certain age do not acquire the auricular feathers, but retain the female plumage, and yet may perform the functions of their elder parents. . . . Bustards, like Turkeys, are voracious feeders on green food such [as] turnip-tops, rye, oats, wheat, etc. in a green state, and also worms, which they would procure on downs and plains. . . .

FEB. 26. 1856.

. . . of the female [Bustard] the one I had, [now] in the Norwich Museum, I think weighed 13 lbs., the one I have weighed 16. I might have imagined the one I have to be a young male, not having examined it anatomically, taking it for granted it was a female from its inferior size; but there is one distinguishing character between the male and female which cannot be mistaken, viz., that [on] the forepart of the neck is a naked bluish black skin extending towards the ear coverts and covering the gular pouch.

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* Literally taken this is a contradiction of the statement four lines above; but the writer's meaning is obvious.—A.N.

March 31. 1856.

. . . From the observations I made, when residing in Norfolk and Bustards were tolerably plentiful, the birds appeared to congregate in the autumn after the breeding-season, the flocks varying from six or seven to ten or fifteen, and I have seen as many as twenty-three. Among the flocks I generally noticed one, two, or three old male birds conspicuously. They frequented the extensive open turnip fields—especially white turnips, or fields of early rye; but as spring came on they imperceptibly disappeared, except one or two being here and there seen in the young corn—no doubt there remaining to breed; but on no occasion did I ever see an old male during the late part of the spring or summer-months, which always led me to suppose they had dispersed to different open localities in various parts of England for the purpose of incubation—such as the plains of Wiltshire and the wolds of Lincolnshire and Yorkshire . . . but I certainly never entertained an idea that they retired to the fen-districts, at least in England, whatever they may do in France or Spain—in fact I never heard of a single instance of their being seen in the fens. I therefore consider the Bustard to be (or to have been) partially migratory in this country; but my observations having been principally confined to Norfolk (and what I have heard of them in your neighbourhood Suffolk) where I had an opportunity of observing their habits and manners for twenty-five years.

I do not believe that Bustards were ever regularly coursed by Greyhounds in a sporting point of view. That such occurrences have accidentally taken place is very probable, although I never knew of such an instance, or could ascertain an established fact. . . . I think such statements must have arisen from young birds (which have not arrived at full plumage) having been surprised by gentlemen or farmers who may have been exercising their greyhounds and accidentally fallen in with them. The greyhounds may have caught them under such circumstances, . . . or old birds may occasionally have been surprised during the moulting-season, and having difficulty in rising at that time have run, which, as you know, they would do very rapidly under such circumstances, and have been caught. . . . But it is my opinion that the coursing of Bustards as a regular diversion was not practised. The birds when they are in perfect feather have much less difficulty in rising than most persons imagine. Therefore unless it was done with young birds before they have attained their plumage, or that an old bird during the moulting-season (when in fact they are in a state of disease and weak) might be taken, I feel quite certain they are not to be captured in that manner. . . . Mr. Hamond who was intimate with the Rev. [Edward] Evans of Eriswell told me he had a male bird alive which he brought up from a young one and was so tame as to eat off the breakfast-table. . . .

. . . I note your enquiry and observation about the egg of the Great Auk, of which I have a specimen, which I believe I lent to Mr. Hewitson some years ago with some other rarities to make drawings from. . . .

May 6. 1856.

. . . I thought I had a tolerable collection, and so I had . . . but it now shrinks into insignificance by the side of . . . Mr. Salmon's, who, I may say, took up the study and pursuit from me.* . . .

. . . I fear the Stone-Curlews will become very scarce birds, at least upon the warrens. . . . When I used to collect their eggs I invariably found only two eggs, and one of them more blunt, obtuse, or oblong than the other. . . . I never knew an instance of the Woodlark breeding in Norfolk, neither did I ever see one, at least in our part of the county. It is possible it might be in the more woody and enclosed parts, and I have heard my father (who was a great observer of birds, from having had a beautiful collection when resident in London) say that the Woodlark was plentiful around London, but was not found so far north as Norfolk, therefore I am inclined to think with you that it is a new comer, and I can also bear out your observation as to its being extremely local in other counties. I was resident for two years near Ross in Herefordshire where it was more abundant than the Skylark, and during the winter months I have repeatedly seen it running about in the sheepfolds. I also saw it in Monmouthshire, but not anything so plentiful, and more local. I also saw, at different times and places, both in Herefordshire and Monmouthshire three or four of the Little Spotted Woodpecker. . . . I was greatly startled when I first heard his note (about this time of the year) being new to me, and it was a long time before I could get a sight of the little fellow who was up among the higher branches; but I never was able to procure a nest at that time, although I have a specimen found in Norfolk many years previous. . . . I am much surprised at my name having been introduced by Mr. Yarrell in his history of the Ringed Plover, as I do not recollect having had any correspondence with him until last year. . . . I was acquainted many years ago with the Rev. W. Whitear of Starston near Harleston, who at that time had a fine collection of British Birds' eggs, and contributed some to me, and it was probably to him, when he was on a visit to my father, that I communicated the circumstance of their [Ringed Plovers] breeding on our warren.†

November 10, 1858.

When I was in Paris in 1816 or 1817 I was introduced to all the principal professors of Natural History at the Jardin des Plantes, amongst whom was Monsr. Dufresne, who had a very fine collection of eggs, amongst which he had two or three of the Great Auk, which (if I recollect correctly) he said

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* Salmon in a letter dated 16th of August, 1834, inserted in the first volume of his Diary and addressed to Lubbock says:—"The only collection of eggs I have ever seen which I consider the best for a public museum is Mr. Scales' and I should most certainly recommend the adoption of a very similar plan" in the Norwich Museum.—A.N.

† See Sheppard and Whitear's 'Catalogue of Norfolk and Suffolk Birds' (Trans. Linn. Soc. vol. xv. p. 37).—A.N.

he obtained from the Orkneys. I was very urgent to secure one, which he let me have upon my engaging to procure for him a particular large shell with the orifice the contrary way, or what may be termed a left-handed shell, which he had not been able to procure, but I was fortunate enough to succeed in doing so in London, costing me two guineas. I think the shell was of the genus *Murex* . . . I shall feel much obliged to Mr. Hancock if he will return it [the Great Auk's egg] as soon as he has made a model of it, and that you will also return it to me as soon after as possible. . . . Be so kind as just to drop me a line to say it has arrived safe, as you may suppose I shall be glad to hear of it having reached you safely.*

NOVEMBER 13, 1859.

I was sorry to hear of poor Mr. Salmon's death. We were living near each other when young men, and he first acquired a taste for oology, botany, and, I believe I may say, Natural History in general, from seeing my collections at that period. . . . I regret extremely that Mr. Wolley should have been attacked by such a malady, which will deprive the lovers of oology of a most valuable member. . . . As regards sending the Auk's egg and the two casts, I will avail myself of your suggestion . . . and I also beg to express my sincerest thanks for your kindness and the trouble you took to bring away with you from Mr. Wolley's the egg and casts.

NOVEMBER 30, 1859.

I have very great pleasure in writing to announce to you the safe arrival of the package containing the Great Auk's egg, and the two models cast by Mr. Hancock, which I consider most exquisitely and correctly made, one being a perfect fac-simile of my own, and no doubt that of his own is equally so. . . . I am sure I feel very much obliged to him not only for the casts with which he has so kindly presented me, but also for the beautiful manner in which he cleaned my Great Auk's egg. . . . I had very great pleasure in sending the egg for the purpose. . . . With regard to 'The Ibis' I consider it a work got up in the highest style and most scientifically edited by Mr. Sclater: but I am utterly confounded to see the immense number of new genera of our British Birds, and were it not for the specific names of some of them the species could not be recognized. The increase which has been made, during my time, is extraordinary, and if it continues to go on as it has done in all the departments of Natural History every species will be a genus of itself. I thought formerly that my late friend Dr. Leach and the late Mr. Stephens had gone to an extraordinary increase but they were nothing to compare to the increase of the present day.

* After this egg had been modelled by Mr. Hancock, it was lent to the late Mr. Wolley to be photographed, and in consequence of that gentleman's unfortunate illness, which proved fatal, it was not returned to Mr. Scales until more than a twelvemonth later.—A.N.

XII.

NOTES ON THE WHITE-BEAKED DOLPHIN (*LAGENORHYNCHUS ALBIROSTRIS*).

By Thomas Southwell, F.Z.S.

Read 31st March, 1885.

Through the kindness of Major Feilden, I had the opportunity of examining with him a very beautiful specimen of this cetacean, which was captured outside the "Knowl" by the smack "Boy Jim," and brought into Yarmouth on the 15th of the present month. It was a female measuring 5 ft. 7 in. in length, and so precisely similar both in outline and colouration to the individual figured and described by Mr. Clark in the 'Proceedings of the Zoological Society' for 1876 (p. 686), that it is useless to repeat a description which has already been so fully and accurately rendered.

So little is known with regard to the distribution and life-history of the great majority of the Cetaceans, that the slightest contribution to the scanty information on the subject is of interest, and as this handsome species, although not many years since considered of great rarity, has now occurred some score times on the British coasts,—in the majority of instances in our own county, but also several times both to the north and south of us,—it may be worth while to summarize these occurrences with a view to ascertaining whether they will throw any light on its habits and distribution.

Commencing with the south, the most southerly locality with which I am acquainted is Ramsgate, I will therefore give the British localities first, and for convenience of reference arrange them in a tabular form.

			Spring.	Autumn.	
1	South Coast (precise locality unknown)	♂	—	—	? 1870
2	English Coast „	♂	—	—	1867
	East Coast.				
3	Ramsgate	♂	1 to 7 Mar.	—	1879
4	Lowestoft	♂	26 Mar.	—	1876
5	„	♀	—	14 Oct.	1881
6	„	♂	26 May	—	1884
7	„	♂	—	Aug.	1884
8	Yarmouth ...	♀	—	Oct.	1845
9	„	—	—	—	? 1848
10	„	♀	—	24 Aug.	1879
11	„	♀	22 Mar.	—	1880
12	„ (very young)	—	—	10 Sept.	1881
13	„	♀	15 Mar.	—	1885
14	Cromer	—	—	Aug.	? 1860
15	Grimsby	♀	—	Sept.	1875
16	Hartlepool	—	—	—	1834
17	Berwick-on-Tweed	—	—	6 July	1881
18	Berwick-on-Tweed ...	♀	—	29 Aug.	1883
19	Firth of Clyde	—	Autumn, 1878 or 1879		
20	Bell Rock	♂	—	7 Sept.	1880
	West Coast.				
21	River Dee, at Little Hilbre ...	♂	—	29 Dec.	1862
22	Dublin Bay	—	—	—	? 1850
23	Donaghadee, County Down ...	—	19 April	—	1883

Foreign Localities.

Belgium. Van Beneden (Nouv. Mém. l'Acad. R. Brux. t. xxxii. 1861) states that two individuals, both females, have been captured off Ostend, one in July, 1851, the other in mid-winter of 1852.

Sweden. The lower jaw of a specimen which was stranded on a sand-bank near Skanör (no date) is, according to Lilljeborg, now in the Museum of the University of Lund. Two pregnant females also, according to the same authority, were caught in July, 1862, at Gullholmen, in Bohuslän.

Schleswig Holstein. Two specimens, one of which furnished M. Claudius the subject of his memoir entitled "Dissert de Lagenorhynchus" (Killiæ, 1853), were obtained at Kiel. Dr. Murie (Journ. Linn. Soc. 1871, p. 142) speaks of this memoir as referring, he believes, to this and allied species; but adds that he had not been able to get a sight of it.

Faroe Islands. Specimens are said by Gray—on what authority I do not know—to have been seen off these islands.

Norway. Lilljeborg mentions a skull in the Bergen Museum from an individual taken in that neighbourhood.

Greenland.—A skeleton in the Museum of the Royal College of Surgeons, was obtained by way of exchange from the Cambridge Anatomical Museum. Mr. Clark informs me, through Professor Newton, that this specimen was purchased by him some twenty years ago in Copenhagen, and that he was told by Professor Reinhardt that it came from Greenland.

Davis Strait.—Eschricht states that this species makes its appearance regularly in Davis Strait in the wake of the migratory fish, at the time when the Beluga and the Narwhal leave their winter quarters for the polar regions.

In the above list, the skeleton of No. 1 is in the British Museum (*cf.* Murie, Journ. Linn. Soc. 1870), as also the skull of No. 14, which was shot by Mr. H. M. Upcher near Cromer. This specimen was recorded by Dr. Gray (Ann. and Mag. Nat. Hist. 1866, vol. xvii. p. 312) under the date of 1866, the year Mr. Oldfield Thomas informs me it was received at the museum. Mr. Upcher tells me it was killed in the month of August, he believes in the year 1860. There is another skeleton in the national collection from a Yarmouth specimen, received in 1848 (but which I cannot find recorded), the skull of which is figured in the Zool. 'Erebus and Terror,' pl. xi. p. 35; and its stuffed skin is also in the museum; this is No. 9 of the above list. A third skeleton was purchased at Stevens' Sale Rooms in 1847, but is without a history. The locality not having been obtained with the last-named specimen, it is omitted from my list.

The Cambridge Anatomical Museum is exceptionally rich in specimens, and contains the skulls of Nos. 2 and 16; also skeletons of Nos. 3, 4, 5, 6, and 7. The skull of No. 16, the first-known British specimen of this species, was obtained by the Cambridge Museum from Durham Museum by way of exchange in the year 1865 or 1866.

The skulls of Nos. 8 and 10 are in the Norwich Museum; and that of No. 13 is now undergoing preparation by Major Feilden, and will find a resting-place in the same institution. The

skeleton of No. 15, which formed the subject of Dr. Cuningham's paper (Proc. Zool. Soc. 1876, p. 679), is preserved in the Museum of the University of Edinburgh. The skin of No. 18 was preserved for the Berwick Museum, and the skeleton for the Edinburgh University Museum: this museum also contains the skull of No. 19, which Professor Turner informs me was shot in the Firth of Clyde in the autumn of 1878 or 1879, and which he believes to have been the first example of this species identified as occurring in Scottish waters. I am also indebted to the kindness of Professor Turner for a note of another skull in his museum, No. 17 of the above list, obtained from an adult individual caught off Berwick on 6th July, 1881, and recorded in 'Land and Water' of 16th July of that year, under the name of *Delphinus tursio*. The skeleton of No. 20, as well as its stuffed skin, are in the Kelvingrove Museum at Glasgow. Of No. 21, both skin and skeleton (as I learn from Mr. T. J. Moore) are preserved in the Liverpool Museum, William Brown Street. A cast of No. 22 Mr. A. G. More informs me is now in the Museum of Science and Art, Dublin, the original not being preserved (see also 'Zoologist,' 1878, p. 293); and through the kindness of Mr. R. Lloyd Patterson, I learn that the skull of No. 23 was preserved, and is now in his possession. With regard to the identification of this individual, Mr. Patterson tells me he did not see it in the flesh; but that he had recently taken the skull to London for comparison, where Dr. Murie and himself had no hesitation in determining its species. The sex of this specimen was not noted. Nos. 11 and 12 I know were not preserved.

It will be observed by the table which I have given, that this species makes its appearance on the British coast with great regularity in the months of March and April. Further south than Ramsgate I am not acquainted with any record of its occurrence: but it is probable that its winter home is the temperate waters of the North Atlantic, and that its summer wanderings carry it northward till stopped by water too cold for it to inhabit, or for the food on which it preys. In its northward migration it passes up the English Channel and through the Straits of Dover, probably attracted by the Herrings, which during the months of March and April approach our east coast. All those which have been met with in spring, with one exception, having occurred on the east

coast. To the West of England, Donaghadee on the Irish coast is the only spring station known. The return migration extends from late in August to the middle of October, when they pass southward through the North Sea, probably again attracted by the Herrings at that time so abundant.

One abnormal occurrence which took place in the month of December, at the mouth of the river Dee, is recorded in the 'Annals and Magazine of Natural History' for April, 1863. All the other instances of which I have exact particulars, have occurred in the spring or autumn months named. Of the eighteen British specimens, with regard to which I have precise information, four have occurred in March, one in April, one in May, one in July, four in August, three in September, two in October, one in the "Autumn," and one in December.

Of the continental specimens, I have not sufficient information to generalize upon. Van Beneden gives the dates of the two Ostend specimens, as one in July, 1851, and the other "au milieu de l'hiver de 1852." It would be interesting to know the dates of the Kiel and Skanör specimens, which probably became entangled either on their northward or return journey in the shoals and intricate channels of the Danish Islands. The date of the Gullholmen specimen is interesting, as it throws light upon the season of reproduction, which probably takes place in the early autumn; in further support of which I may mention the newly-born young one, which I myself saw brought into Yarmouth, on 10th September, 1881.

The food of this species is doubtless the same as that of the Dolphin and Porpoise. In two instances where I examined the contents of the stomach, I found it to consist of Herrings and Whiting.

On the Norfolk coast this species is certainly known by the name of "Scoulter," but whether any other species shares that name with it, I cannot say, I suspect, however, *D. tursio* is also so known. *D. delphis* has never come under my observation on the Norfolk coast, but I strongly suspect it is known at sea to the fishermen under the name of "Bottle-nose Dolphin," and that the name of "Scoulter" is shared alike by *D. tursio* and *L. albirostris*. It is so difficult, however, to determine the species of a Cetacean from the vague descriptions the fishermen give, that I desire to make these remarks with due caution.

XIII.

ORNITHOLOGICAL NOTES FOR 1883.

By Henry Stevenson, F.L.S., V.P.

Read 31st March, 1885.

January.

Grebes. An immature Red-necked Grebe was shot near Yarmouth on the 3rd; and a young Sclavonian Grebe at Potter Heigham on the 5th.

Wild Geese. On the 3rd a Brent Goose was shot flying close to the houses next the beach at Yarmouth; and on the 4th a pair of Bean Geese at Winterton. On the 8th seven Wild Geese of some species were seen to cross Breydon, possibly Pink-footed, as one was shot at Fritton about the same time. On the 19th, the Rev. E. T. Frere of Burston, near Diss, informed me that three flocks of Wild Geese, the largest containing at least forty birds, passed over that parish passing south-east. One flock came down low enough to be fired at, but without effect. An adult Bean Goose was also shot at Halvergate on the 19th; and two were sent up to Norwich from Yarmouth a few days later.

Merlin. A female shot at Potter Heigham on the 5th; and on the 23rd another near Yarmouth.

Shelduck. One shot, and three seen, on Breydon, January 1st, and seven were seen on Breydon on the 10th; two immature were shot there on the 13th, and one on the 16th.

Short-eared Owl. Three were brought into Yarmouth on the 15th.

Waxwing. Two were killed at Gorleston on the 13th, two, also, near Yarmouth on the 19th, and one on the 20th; and one at Tivetshall on the 18th; probably part of the flock that reached us in December of last year.

Snow Bunting. Abundant on the Denes at Yarmouth early in the month. Some two dozen were netted on the 1st.

Grey Wagtail. A single bird, seen by Mr. G. Smith on the Caister Road, near Yarmouth, on the 14th.

Stock Dove. Several of these birds were brought into the Yarmouth market during this month.

Shoveller and other Wild Fowl. A male in half change of plumage was sent to Yarmouth in the first week of the month; two female Golden-eyes were shot on Breydon on the 10th; and many Common Scoters appeared off the North Beach, and in the Roads, on the 21st; but fowl and waders were alike scarce this month.

Shorelark. Three were shot at Yarmouth on the 18th, and nine on the 26th; and others were said to have been seen in a field more inland. On the 27th, a Norwich birdstuffer had, also, seven from Wells.

Rock Pipit. Mr. George Smith of Yarmouth considers this species as a regular, and in some seasons abundant, visitant in autumn and winter to the Yarmouth coast, having shot large numbers at different times on the banks of the Bure, and on Breydon Walls. In December, 1869, he shot eleven and a Meadow Pipit in one day.

Goosander. On the 22nd, Mr. J. H. Gurney, Jun., counted thirteen of these birds in female plumage upon the lake at Gunton, near Cromer.

Black-headed Gull. Mr. Gurney also observed on the same day (22nd) at Gunton, some three hundred of these Gulls; a rather early date for their appearance even thus far inland.

February.

Waxwing. One was seen on a fence at Lakenham, near Norwich, on the 3rd; and another was shot near Yarmouth on the 5th.

Kingfisher. I saw on the 3rd of this month three Kingfishers which had been recently trapped by the legs, and a few inquiries in the neighbourhood whence they came, elicited that many more of these beautiful birds had been similarly sacrificed in the interests of Trout preserving.

Shorelark. On the 5th I saw five of these birds, brought up to Norwich from Cley; one old male had the vinous tints on the shoulders, a rich black gorget, and yellow cheeks.

An Aged Wild Duck. On the 7th of this month, as Mr. J. H. Gurney informs me, a female of the Common Wild Duck died at Northrepps Cottage which had been hatched and brought up there in 1854. It had been blind for several months, and for about eight years had been in complete drake's plumage, except a few brown feathers mingled with the green on the side of the head and neck, and a few normal feathers on the flanks.

Lesser Spotted Woodpecker. Mr. J. H. Gurney, Jun., saw a bird of this species on the 14th which had been sent to a Norwich birdstuffer from Easton; and two more were shot near Norwich this spring. Another was seen about the same time by a reliable authority running up the trunk of a tree at Brooke, also near Norwich.

Wild Geese. Two Grey Geese were seen flying at Horsey on the 1st; and five on Breydon same date. A White-fronted Goose was seen on Heigham Sounds on the 24th.

Sclavonian Grebe. One, immature, was shot at Flegg Burgh on the 9th; and another near Yarmouth on the 10th. This species appears to have been unusually numerous on our coast this winter, but chiefly young birds.

Black-throated Diver. An immature bird shot on the Yarmouth coast on the 14th.

Wild Fowl and Waders. A great scarcity of both on Breydon this month. Two Shelducks, a few Widgeon, and one male Pintail Duck, on Breydon, on the 12th, and a few Grey Godwits are the only species worth notice, except the early appearance of Garganey Teal at Potter Heigham on the 24th.

Goosander. On the 19th, an adult male was shot, one of sixteen which, varying in numbers, had frequented Gunton Lake and Antingham Ponds for some weeks, the flock comprising four adult males and twelve in female plumage.

Shag. One of these birds, somewhat rare in Norfolk, which was in immature dress and, probably storm-driven, had flown so far inland, was shot off the spire of Attleborough Church on the 22nd.

Black-headed Gull. On the 12th and 14th large flocks of small Gulls, no doubt of this species, were observed at Northrepps, passing direct inland from the coast. One noticed on the 12th had the pure black head of its summer plumage.

Lapwing. An enormous flock of these birds, which extended a great distance when fairly on the wing, were seen to rise from the marshes by the river Yare, opposite Thorpe Asylum, on the 24th.

Rock Dove. This species has never been included in the list of migrants to the Norfolk coast, from the obvious difficulty of deciding whether specimens obtained on the coast have not escaped from the trap-shooter, or strayed from the dove-cote; but, as Mr. Hancock includes it amongst the species nesting, to his knowledge, "occasionally in the Cliffs of Marsden, and in other localities on the sea coast, both in Northumberland and Durham, where the cliffs are high;" there seems no reason why real wild Rock Doves from those counties, and still more northern localities, should not voluntarily visit Norfolk at times, and the species be added to our list, if such can be identified. I am led to make these remarks, since, in notes kindly supplied to me from Yarmouth, Mr. G. Smith mentions examples of this species, one or two at a time (half a dozen or more, in a bunch, might suggest a shooting-match) as brought into Yarmouth from the neighbourhood, during January and February of this year (and on previous occasions) with Stock Doves. These birds, although as to their wild origin open to doubt, from the reasons I have stated, at least suggest the desirability that such occurrences, especially in the autumn and winter, should be carefully noted; with particulars as to locality where met with, and under what circumstances, as well as the state of the weather, and direction of the wind at the time.

March.

The marvellous change in the weather, after so mild a winter, which extended from the 6th to the 10th of this month, when gales, most disastrous on the coast from north and north-east, were accompanied, day after day, with heavy storms of snow and sleet till, on the 10th, the snow laid five or six inches deep on my grass plot, and icicles hung from the windows at mid-day, after severe frost at night—it was a curious sight to see my "Charity

Board," thronged with feathered pensioners as in the sharpest winter. Tits, Chaffinches, Robins, and Hedge Sparrows, with Thrushes, Blackbirds, and Starlings all appeared, yet the latter, pinched as they were for food from this sudden deprivation of their usual diet, with both cold and privation, sang merrily in the intervals of sunshine, and paid in melody for their "out-door relief." Strange to say, by the evening of the 10th, the large amount of snow so gradually accumulated, had, to a great extent, disappeared through a rapid ground thaw, without rain, and the temperature still very low.

Shag. Another young bird, but in its second year's plumage, now in my collection, was shot on the 1st of this month, on Yarmouth beach.

Common Wren. A curious clustering of these tiny birds was observed at Northrepps about five p.m. on the 9th, when some six or eight, or more, were seen fluttering against the kitchen window of the keeper's cottage, situated amongst the plantations, and not far from the sea, and may have been a small migratory flock: they flew off into a laurel bush, but disappeared later.

Crossbill. A red-plumaged male bird was shot in a plantation at Mousehold, near Norwich, on the 5th.

Cormorant. Like the Shag before recorded, at Attleborough, a young Cormorant, green only on the back, was shot off the tower of Necton Church, far inland, on the 8th. The bird fell wounded, and severely scratched a man who seized it on the ground.

Waders. Hundreds of the smaller Tringæ appeared on Breydon in the first week of March, with some Ring Plover, and during the severe weather a week later, more of this class of birds were seen than in all the winter months. Several Golden Plover, at this time, were well forward in summer plumage. Ruffs and Reeves appeared at Potter Heigham in March, but are supposed not to have remained to breed.

Rough-legged Buzzard. One shot at Potter Heigham on the 14th.

Brambling. These birds were plentiful about Yarmouth during the frosts.

Grey Wagtail. One shot at Yarmouth on the 10th.

Wild Geese. A large flock of Geese appeared on Breydon on the 14th, just after the storms of wind and snow; and three Grey Lag Geese on the 24th were killed out of a flock of seven.

Kite. Mr. Edward Boult of Potter Heigham informed Mr. Southwell that a fine Fork-tailed Kite flew over him, about thirty yards high, on the 21st.

April.

Summer Migrants. Chiffchaff heard, Northrepps, 4th. Wryneck, Harleston, 6th. Sand Martin, Aylsham, 5th; Taverham, 8th. Willow Wren, Aylsham, 11th. Redstart (male), Keswick, 10th; a female caught at Hunstanton lighthouse on the 12th. Nightingale, Keswick, 18th; Aylsham, 19th. Swallow, Aylsham and Yarmouth, 15th. House Martin, Eaton, 25th. Cuckoo, Aylsham, 19th.

Cormorant. One seen on a post in Breydon Channel on the 12th.

Water-hen variety. A specimen of the so-called Hairy Water-hen was shot near Norwich on the 4th, and was exhibited at a subsequent meeting of our Society. (See paper on and list of similar specimens by Mr. J. H. Gurney, Jun., Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 581.)

Woodcock. Single birds seen at Northrepps on the 10th and 15th.

Hobby. One seen at Northrepps on the 19th.

Shelduck. A pair shot on Breydon on the 12th.

Hoopoe. One shot at Horstead on the 25th.

Twite. A pair of these Linnets were netted at Yarmouth on the 15th, rarely seen there in spring.

Common Buzzard. An adult male, just beginning to moult, was trapped at Northrepps on the 27th.

Osprey. Mr. G. Smith informs me he saw an Osprey in the first week in April, flying over the Caister marshes from the sea.

Terns. Lesser and Black Terns on Breydon, April 30th.

May.

Summer Migrants. Turtle Doves heard at Northrepps on the 1st. Swifts, Cromer and Aylsham, 9th; Norwich, 12th. Spotted Flycatcher, Northrepps, 12th. Nightjar, Sandringham, 14th; Northrepps and Aylsham, 20th.

Pied Flycatcher. A single bird was seen at Northrepps on the 9th.

Land-rail. Two of these birds were picked up dead, this month, under the telegraph wires, one near Norwich on the 9th, the other at Brandon on the 12th, killed, most probably, on their migratory arrival, as on the 13th one was caught alive in the west porch of Cromer Church, and about the same date Mr. J. H. Gurney, Jun., saw one flying over a road at Northrepps. One said to have appeared at Clippesby, near Yarmouth, on the 5th, and another at Winterton on the 9th.

Hoopoe. One was shot at Hanworth, near Cromer, on the 10th; and I may also record one shot at Lowestoft on the 25th of April.

Waders. Of these spring migrants, an adult Kentish Plover was shot on Breydon on the 3rd, and another on the 9th; and I saw a Black-tailed Godwit on the 12th, and one or two Bar-tailed, in change. Sanderling assuming summer plumage, 16th and 21st. Three fine Turnstones, 21st, and several good Black-breasted Grey Plover. On the 20th I saw, on Cromer beach, a single Whimbrel wonderfully tame, and two from Yarmouth on the 21st: one was shot at Yarmouth, April 12th, a very early date. A Land Dotterel was shot at Halvergate on the 9th, in immature plumage, and two adults seen. Six Knots in good red plumage were killed on Breydon on the 30th.

Spoonbill. Two seen on Breydon on the 1st, but not shot.

Avocet. Two seen on Breydon on the 9th, and one shot.

Green Woodpecker. The abundance of this species, in certain favourable and wooded localities, is pretty well established by the fact, that a thoroughly reliable authority informs me, that in the middle of May, between Norwich and Thurning, where he went Rook-shooting, and returning by Haverland and Swannington, he saw not less than a score of these birds.

Wood Pigeons and Turtle Doves. This summer a pair of Wood Pigeons and a pair of Turtle Doves nested in Mr. C. Barnard's garden, next Park Lane, on the Unthank's Road. I have never known the Wood Pigeon nest so near the city before; but as far back as 1850, I remember Turtle Doves nesting in the Wilderness garden on Bracondale.

Aviary Notes. For the first time a pair of Twites nested and hatched young in my aviary; and a young Skylark was hatched on the same day. These were not reared, however, from the difficulty of supplying any suitable food for the nestlings that would not be

devoured by all the other birds. Young Greenfinches seem to thrive on the seed softened in the crops of the old birds.

Osprey. One seen on Breydon, May 14th.

Golden Oriole. Mr. Smith informs me a female, in greenish-yellow plumage, was shot at Chedgrave on the 19th.

Harriers. An immature Marsh Harrier, with the yellow head, was killed at Burgh, by Yarmouth, on the 29th, and a young male Montagu's Harrier at Horsey, earlier in the month.

Nightingale and Cuckoo. The notes of these two birds were heard simultaneously at midnight at Northrepps on the 19th.

June.

Osprey. One was seen on the 1st on a Willow at Downham, near Brandon, by Mr. F. Norgate.

Short-eared Owl. An adult female was shot at Drayton on the 12th; but from its worn plumage and poor condition, it had most likely been previously wounded, and unable to migrate.

Garganey. Several pairs of these Ducks were known to have nested and had young broods in the Broad district, of the Bure, this month.

White-winged Black Tern. Mr. B. C. Silcock informed me that when sailing on Barton Broad on the 8th, he had the rare pleasure of watching a pair of these birds hovering over the water, and occasionally settling on a post. On the 10th, a male of this species, and no doubt one of the pair, was shot from a post on Hickling Broad. It was alone at the time. When fresh killed the bill is said to have been brown with a tinge of lake-red at the gape of the mandibles, irides hair-brown, feet and legs bright orange-red.

Montagu's Harrier. On the 22nd a male of this species, one of a pair which had a nest this season in the marshes about Hickling, was shot and sent up to Norwich. It had still some brownish tints upon the back and shoulders, though otherwise in adult plumage, and some of the tail feathers, unmoulted, were worn to mere stumps. The female was subsequently shot at, but missed, as she rose from the nest, and four eggs were taken, but not all at the same time. The hen bird still frequented the neighbourhood till the beginning of July. An eye-witness thus described to me the actions of these birds. The female sits as soon as the

first egg is laid. The male attends upon her, and seeks for prey, with which he flies round her, giving a sharp cry, and drops it a little distance from the nest. The female then takes wing, picks up the prey from the ground, and, alighting with it still further from the nest, makes her meal, when she again settles on her eggs. [It was the attempted destruction of these birds which called forth the strong and well-merited censure of our President in his last year's address, as, if unmolested, these Harriers would still, as in former days, be a marked and attractive feature during the summer months upon our larger broads.]

July.

Magpie. One was seen at Northrepps on the 7th, attacking a young Pheasant about the size of a Thrush.

Grey Crow. Two seen at Scratby near the shore on the 15th.

Waders. On Breydon, Common Sandpiper, Greenshanks, and Dunlins, 18th; and six Wimbrel on the 22nd; a little Stint on the 27th; a flock of twenty Wimbrel, two Pigmy Curlews and Common Sandpiper on the 29th, and on the 31st; six big Curlews, Ring Plovers, and Wimbrel. On the 8th, a young Sanderling; 9th, immature spotted Redshanks, four out of six shot, four Greenshanks shot out of six, and two Wimbrels; on the 11th, Knots, and a Wood Sandpiper, and Turnstone; 13th, a Green Sandpiper, and an immature Wood Sandpiper; on the 17th, two Spotted Redshanks, dark birds, and one Reeve seen; one Common Sandpiper on the 21st.

Terns. On the 10th and 11th a young Black Tern on Breydon, and immature Common, Arctic, and Lesser Terns.

Ducks. Several Garganey Teal shot at Ranworth on the 1st, and three Pochards were killed on Breydon out of seven on the 17th. Two adult and one young Great Crested Grebes on the 18th.

August.

Migration. On the night of the 6th, at ten o'clock, heard Plover over the city, very dark at the time. At Cambridge the night before, I heard the same notes over the town. On the 8th, about ten p.m., after a heavy rain, with dark clouds about, heard mingled noises of birds passing over my garden, Plover and small Tringæ apparently amongst them, and one Curlew very noisy, going north-

east to south-west. August 24th, at eight p.m., a single Curlew passed in the same direction, calling incessantly.

Waders. In Yarmouth market on the 1st, Wimbrel and Curlew, an immature Ruff and two Reeves. On the 5th, from Breydon, two Oystercatchers, Knot, Pigmy Curlew, and a Turnstone.

Crossbill. A male in red plumage shot at Braconash, near Norwich, on the 31st.

Water-rail. These birds must have been exceptionally plentiful this year in Norfolk, as Mr. Edward Bidwell was informed by one dealer he had received over two hundred eggs from Yarmouth, and others had been supplied with them as well.

Stock Dove. Two in Yarmouth market, August 11th.

September.

Manx Shearwater. One shot on Breydon on the 4th.

Red-necked Phalarope. One killed on the banks of the Bure, near Yarmouth, September 7th.

Little Gull. An adult bird shot on Breydon on the 13th.

Blue-throated Warbler. An immature specimen of the Red-spotted race was shot on the 15th, on the south side of Breydon wall, and on the previous day another was shot at Blakeney by Mr. F. D. Power. As will be seen by Mr. Gurney's paper (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 597) on the occurrence of this species in some numbers this autumn, upon the Cley and Blakeney sand-hills, between the 14th and 22nd of September, Mr. Power secured nine specimens, all in more or less immature dress, which, with many others seen, consorted with various common summer migrants, amongst the Warblers.

Pied Flycatcher. An immature bird shot on the Denes at Yarmouth on the 15th.

Honey Buzzard. Two were seen by Mr. Cremer during this month at Beeston, near Cromer.

White Wagtail. Strange as it may seem, that a species so common across the Channel should be unrecognised here, we certainly owe to Mr. H. M. Upcher's observation the addition of this Wagtail to our Norfolk list. In his address last year, as President of this Society, he stated that for three or four days in September, 1883, he watched a pair of these birds on his lawn at

Feltwell. These two were adult, and he thinks some immature with them. Fortunately to make identification more sure, by comparison, several of our British Pied Wagtails were in company at the time, so that the difference was most marked.

Waders. Mr. Smith's notes from Breydon and Yarmouth beach comprise a Little Stint on the 8th, and Pigmy Curlew; another Little Stint on the 14th, and three next day; and one on the 16th, with two Greenshanks, a Sanderling, Ruff and Reeve, and a Land Dotterel, immature, and two Red Knots; a Spotted Redshank on the 8th; one Woodcock seen in a garden on the 18th; another Little Stint on the 24th; a Solitary Snipe with four Jack Snipes was shot on the 29th at Potter Heigham.

Migratory Warblers, etc. Wheatears at Happisburgh, Northrepps, and Overstrand on the 12th and 13th, and Redstarts seen; hundreds of Chaffinches about Yarmouth Denes on the 22nd; and on the 29th Mr. J. H. Gurney, Jun., shot a Greater Whitethroat at Blakeney, and a Snow Bunting on the same day.

Kingfisher. I am informed that at least fifty of these beautiful birds were shot this autumn in the Yarmouth district, and though many of these were no doubt autumnal visitants to our coast, many would also be home-bred, and such a wholesale destruction is much to be regretted, if it cannot be prevented.

Eared Grebe. An immature specimen shot on Breydon on the 15th; and a male and female at Somerton about the same date.

Merlin. A bird taken on a vessel at sea was brought into Yarmouth on the 24th.

Goosander. Two early arrivals were seen on Breydon on the 25th.

Cormorant. In the 'Zoologist' for 1884 (p. 10), Mr. Gunn mentions four or five young birds seen in Yarmouth Roads early in September, and he saw one on the 11th about one hundred yards off the beach.

October.

Waders on Breydon and Coast. Two or three Solitary Snipe were shot early in the month, and a Purple Sandpiper on the 5th; about forty Golden Plover seen on the 9th; on the 12th, a Woodcock brought into Yarmouth alive, taken on board a fishing boat, another was shot on the shore on the 16th, and on the 22nd one created

great excitement in Yarmouth market-place as it flitted over the stalls; ten were shot the same day, mostly on the North Denes, a numerous flight of these birds appeared on the North Norfolk coast on the 31st; a Spotted Redshank was shot on Breydon, on the 22nd, and four more, out of a flock of seven, were shot in Terrington marsh, near Lynn, on the 27th, by Mr. W. D. Ward.

Little Gull. A dark young bird shot at Hickling or Potter Heigham on the 7th.

Great Grey Shrike. One killed at Horsey on the 9th.

Stormy Petrel. A single bird was brought into Yarmouth, alive, on the 12th, caught on a vessel off the coast.

Richardson's Skua. A dark immature bird killed near Yarmouth about the 9th.

Red-throated Diver. A good adult bird shot on Breydon on the 16th.

Rough-legged Buzzard. One was shot on Yarmouth Denes on the 20th, and another at St. Olaves, in the adjoining county, on the 13th.

Shorelark. One male shot at Winterton on the 4th; and some seen at Yarmouth on the 24th and 28th. Of four shot on the latter date, three were immature males.

Ring Ouzel. A pied variety was obtained near Yarmouth on the 24th.

Red-necked Grebe. An adult bird in half change of plumage was shot on Breydon, on the 24th.

Red-necked Phalarope. A young bird killed on the beach at Yarmouth, same day.

Migrants. About the 8th of this month the Yarmouth bird-catchers were netting Siskins, Linnets, and Goldfinches; on the 13th hundreds of Skylarks and numbers of Greenfinches made their appearance. Grey Crows and some Jackdaws appeared on the coast at Northrepps on the 6th and 8th; and Grey Crows in large numbers, and some Black Crows, appeared at Yarmouth on the 14th. On the 20th, at the same place, Missel Thrushes arrived in considerable flocks. At Cromer lighthouse on the 13th, between three and five a.m., seven Skylarks and one Starling struck the light, and at Happisburgh, between four, and twenty minutes past five, a.m., seventy-two Larks, eight Starlings, and a male and female Brambling struck the lighthouse,—the first big flight of the season.

In the 'Field,' about the 11th, a passenger by a steamer records in the passage from Aberdeen to London, the appearance on board of six Chaffinches, a Rook, and a Woodcock when off Cromer. The wings of the following species killed at Lynn Well lightship were sent to Mr. J. H. Gurney, Jun., on the 17th:—Kestrel, Snow Bunting, Chaffinch, Robin (two), Wren, Goldcrest. The presence of the Common Wren amongst these migrants is very interesting.

November.

Wild Geese. Two Pink-footed Geese were shot in South Breydon marshes on the 1st, and one Grey Lag, shot out of three seen on Breydon on the 4th: another was shot in the neighbourhood on the 17th.

Spotted Rail. One shot near Yarmouth on the 6th, and one or two in the neighbourhood in the previous month.

Grey Shrike. One killed near Yarmouth on the 8th.

Red-throated Diver. An adult bird shot on Scratby beach on the 10th.

Shorelark. Two shot on Breydon wall on the 13th, and one shot and three more seen on Yarmouth Denes on the 22nd. Mr. Smith thinks that this species, and Snow Buntings also, passed further inland this season, instead of frequenting the Denes and shore line.

Sclavonian Grebe. A single bird shot on Breydon on the 14th.

An Aged Ring Dove. Mr. Smith informs me that he saw one on the 22nd, which had just died, but had been taken and brought up, as a nestling, and had lived in a cage for nineteen years.

Wild Ducks. The only fowl of any note on Breydon this month seem to have been a few Scaups, Pochards, immature, and a male Shoveller in change of plumage; and five Golden-eyes at Hickling. Mr. E. Boult informed Mr. Southwell that Scaup Ducks appeared with Pochards and Wigeon on the Broad waters at Potter Heigham early in October. A Gadwall and some Pintail Ducks were taken in Westwick decoy about the 30th.

Great Spotted Woodpecker. One shot at Somerton, adult female, on the 10th.

Waders. Hundreds of Golden Plover and Lapwings were seen in the South Breydon marshes on the 1st, when a flight of Woodcocks occurred, and several were shot on the Denes, and another

flight seems to have come about the 24th; a single bird was found dead at Northrepps on the 26th, having flown against a building in the night. Several Short-eared Owls appeared in Yarmouth market during this month; Snipe not plentiful; a few Dunlins on Breydon on the 12th, and a Purple Sandpiper was shot there on the 13th; a Water-rail was taken alive on board a boat off Yarmouth on the 12th; on the 24th a flock of about fifty Golden Plover passed inland at Northrepps going west.

Migrants. Hooded and Carrion Crows still arriving at Yarmouth between the 1st and 6th. A Grey Crow shot on the 25th had the mandibles twisted like a Crossbill. Two Swallows were seen at Northrepps as late as the 16th; a good many Cole Tits were seen in plantations on the Caister road, near Yarmouth, on the 4th, and both these and Long-tailed Tits appeared in the same locality in the previous month. A good number of Rock Pipits arrived about the 22nd on the walls of Breydon and the Denes. The following species were also identified by Mr. J. H. Gurney, Jun., by wings sent of specimens killed at Lynn Well lightship, between the 4th and 9th of this month:—Thrushes (twelve), Redwing, Chaffinches (ten), Blackbird, Snow Bunting (four), Wheatear, Brambling, Tree Sparrow, Fieldfares (four), Knot Sandpipers (four), Storm Petrels (six), Jack Snipe, Dunlin Sandpipers (three).

December.

Eider Duck. The chief ornithological event of the winter was the appearance of some half dozen, and probably more, of this species, all, so far as I could learn, either adult females or immature birds. It was not till the 2nd of December that I learnt from Mr. G. Smith of Yarmouth, a female Eider had been seen, but not shot, on Flegg Burgh Broad on the 22nd of November, and this probably marks about the date of arrival of these birds on our coast. A part, evidently when shot at and dispersed on Breydon, passed inland, and frequented fresh waters for a time. This seems apparent from the fact that an adult female, said to have been seen, with others, in the same locality, was killed with a stone on the 11th of December, upon a small stream near Hellesdon mills, near Norwich, and like the one to be next mentioned was said to have been strangely tame. This

bird was presented by Mr. J. H. Walter to the Norwich Museum. On the 12th, Mr. G. Smith informed me a supposed immature female, seen in company with six more, was shot on Breydon, and this bird was so tame that it came to the boat yard, and boys threw stones at it. On the 14th, another, described as a young male, was also killed on Breydon, and the plumage of both was described as very dark. It is quite probable that four large diving Ducks seen by Mr. J. Barwell on Bridge Broad, Wroxham, ten days later, may have been the remnant of this flight, judging from his account of their size, form, and actions. I may also record that an immature male, in my collection, was caught in a Lincolnshire Decoy about the same time, and was sent to Norwich alive.

Peregrine. An adult female was shot at Haverland on the 10th.

Waders. Woodcocks decidedly numerous this autumn and winter, as shown in the Yarmouth district, and bags made at Westwick and Sheringham; but the noted Swanton Wood did not make the return expected this year. A Bittern was shot on Barton Broad on the 23rd. At Yarmouth on the 8th, Knots and Sanderlings shot on the Beach.

Ducks. A little frost and snow in the first and second weeks brought a good sprinkling of fowl to Yarmouth, mostly Duck and Mallard, Wigeon and Teal; and on the 12th, three Pintails, two males and one female, on Breydon.

Wild Geese. Some notice was taken in our local papers, both at the end of November and during this month, of flocks of Geese, on one occasion numbering over eighty birds, passing over the city at mid-day. Mr. Gunn, who recorded their occurrence in the 'Zoologist' for 1885 (p. 57), was no doubt correct in supposing them the half-wild Canada Geese, bred in large numbers on various estates in this county, and which, in sharp weather, being unpinioned, take long flights from their home quarters.

XIV.

MISCELLANEOUS NOTES AND OBSERVATIONS.

Note on Eggs of the Great Bustard. While the progress of civilisation has during the last century done a great deal towards lessening the number of species of birds breeding in the British Isles, the ornithologist may fairly hope that the protection afforded by the legislature of the last few years may gradually restore to the country, as breeders, some of the species that were formerly indigenous. We know that for the last four or five years the Black Tern has nested in Lincolnshire. The Ruffs and Reeves have been seen during the breeding season in our county within the same period; and a nest with eggs has been found this year. The Short-eared Owl, formerly of frequent occurrence in the Fens, has again nested; and certainly one out of the three species of Harriers that were resident in this county has nested here again, though unfortunately it was not allowed to do so in peace last year.

Savi's Warbler may perchance visit us, and find a safe retreat in some of the Reed-beds of the Broads, but the Avocet is far too conspicuous a bird, and nests in situations too exposed to stand much chance of escaping the wiles of collectors and dealers, should it try to re-establish itself in the haunts which it frequented for nesting purposes in the early decades of this century. Thanks to careful protection, the re-introduced Capercaillie has increased, and extended its range; so that now, for the first time for many hundreds of years, it may be numbered as an English as well as a Scotch resident: but the Crane, after a lapse of three centuries, is not again likely to be numbered among the breeding birds.

The Great Bustard is too conspicuous, from its size, to escape molestation for any length of time; and it could only nest again under circumstances so exceptional, that no one could expect them to occur. For this reason, to the collector of British-taken eggs, that of the Great Bustard is of especial value; and it is therefore of interest to record the change of ownership of any of the very limited number of authenticated British specimens.

From the 'Birds of Norfolk' (vol. ii. p. 42) I copy the following:—

"The Rev. R. Gwilt of Icklingham, Suffolk, informs me that he has two eggs laid many years ago in that once noted district, and that a third from the same locality, was presented some forty years since to Lady Wilson of Hampstead."

The last-named egg afterwards passed into the possession of the late Sir Walter C. Trevellyan, Bart., of Wallington, Northumberland, by whom it was bequeathed, with his magnificent egg of the Great Auk, to the Oxford University Museum. The fine collection of eggs formed by Canon Tristram, which has lately been acquired by one of the members of this Society, Mr. Philip Crowley of Waddon, contains a Great Bustard's egg; and through the kindness of the present possessor, I am enabled to give the following extract from the egg register kept by Canon Tristram:—

"Taken by Mr. Salmon on Great Massingham Heath, Norfolk, 1832. This egg is the single one alluded to by Yarrell. It was given by Mr. Salmon to Mr. Hoy, who gave it to Mr. Heysham. Mr. Salmon recognised it at Heysham's sale, and pointed it out to me."

This egg is blown with two holes at the side, and bears the following particulars in Dr. Tristram's handwriting:—

"Otis Tarda single egg
Mr. Heyshams Sale
Great Massingham Heath
Norfolk 1832. J. D. Salmon
v. Yarrell v. 2. p. 420."

It also has a label attached in Mr. Heysham's handwriting, with the words

"This egg I got from Hoy."

Again I make an extract from Mr. Stevenson's work (vol. ii. p. 39), where, speaking of the five eggs taken on Great Massingham Heath in 1833, he says:

"Another of this same series of eggs from Massingham, was also in Mr. Salmon's collection bequeathed by him to the Linnean Society, *but this* with many other of the rarer specimens, disappeared in a mysterious manner before the Society had been able to take possession of their valuable legacy. It formed the subject of the figure in the last edition (1866, pl. lxxiii. fig. 1) of Mr Hewitson's well-known work, and should it still be in existence would probably be recognised by its portrait."

Since 1877, when I had some correspondence with Professor Newton about this egg, I have carefully examined every Great Bustard's egg I have had the opportunity of seeing in collections, with the hope of finding it, especially as I was kindly supplied by Professor Newton with some additional particulars about it copied from the late Mr. John Wolley's note-book. Last year I was fortunate enough to find the object of my search, and that in the very last place I should have thought of looking for it, after reading the above extract; namely, in the cabinets containing the Salmon Collection in the Linnean Society's Rooms.

It is unfortunately true that many of the rarer specimens—including the Great Auk's egg—disappeared in a mysterious manner; but, fortunately, the thief overlooked this and one or two other extremely interesting eggs. In January last I had the pleasure of looking through the collection with Professor Newton, who was perfectly satisfied with the identity of the egg.

I have no doubt it will afford Mr. Stevenson very great pleasure to re-write this paragraph in the next edition of his valuable 'Birds of Norfolk.'—Edward Bidwell.

Botanical Notes, 1884. The Rev. E. F. Linton reports the following additional *Rubi* and *Rosæ*:—

Rubus villicaulis, W. and N. Sprowston.
„ macrophyllus, Weihe. Sprowston.
„ umbrosus, Arrh. Sprowston and Mousehold.
„ Radula, Weihe. Sprowston and Mousehold.
„ „ var. rudis, Weihe. Sprowston and Mousehold.
„ glandulosus var. *α* bellardi. Sprowston, Mousehold.
Rosa tomentosa var. scabriuscula, Sm. Rackheath.
„ canina var. sphœrica, Gren. Sprowston.
„ „ „ senticosa, Ach. Loddon.
„ „ „ urbica, Lem. Thorpe, Sprowston.
„ „ „ tomentella, Lem. Earlham, Loddon.
„ „ „ Borreri, Woods. Sprowston.
„ „ „ marginata, Wallr. Sprowston.

Also—

Artemisia gallica, Willd. Wells.
Bidens radiata. Postwick.
Juncus lamprocarpus var. nigritellus, Koch. Wells.

Mr. Arthur Bennett reports :—

Statice limonium var. pyramidalis, Syme, near Cley, found by Mr. Hanbury.

Potamogeton prælongus, Wulfen, at Welney, found by Mr. Fryer.

Mr. F. J. Hanbury reports :—

Atriplex littoralis var. marina, Cley.

Mr. F. Long has sent from Wells an interesting variety of *Sonchus arvensis*, not referable to any named variety, but new to both Mr. Bennett and myself; and

Trifolium pratense var. parviflorum, Bab., a curious variety from the common form of that species.—H. D. Geldart.

Thrincia tuberosa, D.C. Is a small Hawk-bit not uncommon in the south of Europe, growing mostly in very dry situations, and consequently liable to be scorched up in the summer. To guard against extinction before its seeds are matured, it sends forth long thread-like suckers in a circle of nearly three feet from the plant. On these threads round tubers are produced at intervals. While amusing myself on the sloping shore at Biarritz last summer, my fingers came in contact with one of these bright yellow tubers; and I traced its fibre to the starting-point, a Thrincia growing the length of my umbrella distant. Further search showed similar threads passing in every direction which made it extremely difficult to follow any particular thread; also these suckers were so brittle at the point of junction with the tubers, that I was often puzzled as to which fibre I ought to follow. The largest tuber was about the size of a marble, nearly round, with an "eye" near the connecting-point, and filled with starch. These tubers evidently act as a means of preservation against the intense heat, as I never found them on the plant during the winter months at Cannes.—A. M. Barnard.

Additional Specimens of the "Hairy" variety of the Moorhen (Gallinula chloropus). A female of this variety of the Moorhen was taken at Garstang in Lancashire, on 13th of October, 1884, and is in the possession of Mr. W. F. Brockholes, by whom it is recorded in the 'Zoologist' for 1885 (p. 31). Mr. H. Langton, a competent authority, who examined its anatomy, thinks it an oldish bird, as the processes at the side of the sternum were ossified down

to the end. The presence of transverse bars, having the appearance of being impressed or indented (*vide* Trans. Norfolk and Norwich Nat. Soc. vol iii. p. 584), was more apparent than in any example yet examined, extending over the whole of the body. It was stuffed by Pratt of Brighton, who reports that he found it very tough to skin. He says that the frontal shield was not red, but a dark olive colour: as far as he recollects there was no trace of a red garter on the tibia. Nothing was observed in this case to prove that these "hairy" varieties of the Moorhen owe their peculiarities to disease (*l. c.* p. 584). In addition to the twelve examples before enumerated (*l. c.* p. 586), three more have come to light besides the one just mentioned; viz., one killed some time ago (where, is now forgotten), in the possession of Dr. W. Tegetmeier, and two in the possession of Captain Bagge, shot at Mintlyn, near King's Lynn, for a knowledge of which I am indebted to Dr. J. Lowe. Dr. Lowe informs me that they were shot at the same time—but when is not remembered—by a gamekeeper, who reported that there were others like them in the same brood.—J. H. Gurney, Jun.

Norfolk Amber. Since the publication of my note on Norfolk Amber, Mr. A. C. Savin has placed in my hands a specimen containing a Spider. This was sent to the Rev. O. P. Cambridge, who states that it seems to be "certainly a *Linyphia*, Latr. and Blackw., of the restricted genus *Bathyphantes*, Menge, but of no recognisable known species, and its specific characters are too much injured and concealed to permit of any satisfactory description."—Clement Reid.

Cryptus pygoleucus. *Pezomachus hopei*, Gr., female, and *Cryptus pygoleucus*, Gr., male, were bred together by Mr. W. H. B. Fletcher, of Worthing, this spring. Finding the males of the apterous group of Cryptides is very difficult, and extremely interesting when they are detected. Consequently *Pezomachus hopei* must be put aside, and in future known as the female of *Cryptus pygoleucus*, Gr.—J. B. Bridgman.

3 OCT 1885

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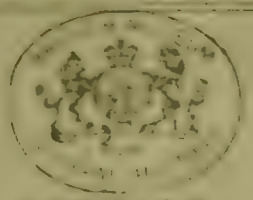

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Rawson H. E., F.Z.S., 7 *Cannon Street, E.C.*
Reeve J.
Reid Clement, F.G.S., *H.M. Geological Survey Office, London*
Riches H. C.
Roche E. B., M.D.
Robinson H. S.
Rosebery The Rt. Hon. the Earl of, *Berkeley Square, W.*
Royal Microscopical Society, President of the, *Hon. Mem., King's College, London*
Ruston A. Harold, *Chatteris*

S

Saunders Howard, F.L.S., F.Z.S., 9 *Radnor Place, London, W.*
Seebohm H., F.Z.S., 6 *Tenterden Street, London, W.*
Smith G., *Yarmouth*
Southwell C., *Gurrey Lodge, Childs Hill, N.W.*
Southwell T., F.Z.S.
Southwell W. C., *Swaffham*
Spelman H.
Spelman W. W., *Great Yarmouth*
Spratt A. W., M.A., *St. Catherine's College, Cambridge*
Squirrell M. P.
Stanley Joseph
Stedman M. R., *Alethorpe*
Stevenson H., F.L.S., V.P.
Stracey Miss, *Rackheath Hall*
Stringfield W., *Lowestoft*
Sutton Francis, F.C.S., Ex-President

T

Tancock Rev. O. W., M.A.
Taylor A. H. O., *Thorpe*
Taylor H. M., *Dilham*
Taylor I. O. Howard, *Thorpe*
Taylor S. T., M.B.
Todd J. T.
Toll Octavius
Tuck W. H., 67 *Cathcart Road, London, S.W.*
Turner Hugh, *Ipswich*

U

Upcher H. M., F.Z.S., *Feltwell*
Utting S. W.

V

Vaughan Matthew, *Haileybury College*

W

Walsingham The Rt. Hon. Lord, V.P., *Merton Hall*
Walter J. H., *Hellesdon Lodge*
Warren Rev. J. W. Corbould, *Tacolnestone*
West A., *Wymondham*
Wharton C. B., F.Z.S., *Hounsdown*
Wharton H. T., M.A., F.Z.S., 39 *St. George's Road, N.W.*
Wheeler F. D., M.A.
Whitaker Joseph, *Rainworth Lodge, Mansfield*
White R. W.
Whitty C. R., *Hunstanton*
Williams C.
Wilson H. F., *Trinity College, Cambridge*
Woodward H. B., F.G.S., *Hon. Mem.*, 7 *Kelvin Terrace, Highbury Park, N.*

Y

Young John, F.Z.S., 64 *Hereford Road, London, W.*

The Treasurer in Account with the Norfolk and Norwich Naturalists' Society, Year ending 29th March, 1886.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from last year	9	9	0	By Fletcher and Son, for Printing *Transactions*, 1884—85	36	15	0
,, Subscriptions :—				,, Ditto for Printing Laws	1	5	0
2 for 1884—85 £0 10 0				,, G. E. Hawes for New Book-case	9	10	0
191 ,, 1885—86 47 15 0				,, Stevenson & Co., for Printing	0	17	0
1 ,, 1885—86 0 10 0				,, Goose & Co., for ditto	2	16	6
6 ,, 1886—87 1 10 0				,, Insurance	0	3	0
	50	5	0	,, G. Quinton, Book-binding	2	4	0
,, Additional payments for monthly summons	0	13	0	,, Gratuity to Doorkeeper	0	10	0
,, Sale of *Transactions*	3	7	6	,, Postage, Stationery, and Carriage	5	16	6
,, Literary Institution for Old Book-case	5	0	0	,, Museum Subscription	2	2	0
,, Transferred from Life Membership Fund	10	10	0	,, Assistant-Secretary's Salary	5	0	0
,, Interest	0	15	9	,, Balance in hand	13	1	3
	£80	0	3		£80	0	3

LIFE MEMBERSHIP FUND.

	£	s.	d.		£	s.	d.
To Balance from last year	68	5	7	By Transfer to Current Account	10	10	0
,, 1 Composition for Membership	3	0	0	,, Balance in Post Office Savings Bank	62	5	9
,, Interest	1	10	2				
	£72	15	9		£72	15	9

Norwich, 29th March, 1886.

Examined and found correct.

STEPHEN WM. UTTING, *Auditor.*

List of the Publications received by the Society as Donations or Exchanges from March, 1885, to March, 1886.

Adamson (C. M.). Another Book of Scraps, principally relating to Natural History. Oblong fcap. folio. Newcastle-upon-Tyne, 1882. *From Mr. J. H. Gurney, Jun., F.Z.S.*

Agassiz (Alexander) and others. Selections from Embryological Monographs. 4to. Cambridge, U.S.A., 1882—84.
From Professor Newton, F.R.S.

Contents:—

I. Crustacea, by Walter Faxon. With 14 plates.
III. Acalephs, by J. W. Fewkes; and Polyps, by E. L. Mark. With 13 plates.

Algeria. Chasses de l'Algérie et notes sur les Arabes du sud; par la Général A. Margueritte. Sm. 8vo. Paris, 1869.
From Mr. J. H. Gurney, Jun., F.Z.S.

Allman (G. J., M.D.). A Monograph of the Gymnoblastic or Tubularian Hydroids. In two parts. [Published by the Ray Society.] Folio. Lond. 1871—72.
From Professor Newton, F.R.S.

Bailey (Charles, F.L.S.). On the structure, etc., of Naias graminea, var. Delilei. 8vo. Lond. 1885. *From Mr. A. Bennett, F.L.S.*

Bath Natural History and Antiquarian Field Club. Proceedings, vol. v. no. 4. 1885. *From the Club*

Belgium. Annales de la Société Malacologique de Belgique. Tomes 15, 18, 19. Royal 8vo. 1880—84. *From the Society*

——— Annales de la Société Belge de Microscopie. Tomes IX. et X. Année 1883—84. *From the Society*

Bennett (Arthur, F.L.S.). Recent additions to the Flora of Iceland. [Reprinted from the 'Journal of Botany,' for March, 1886] pp. 5. *From the Author*

Berwickshire Naturalists' Club. Proceedings, vol. x. no. 3. 1885.
From the Club

Birds. An Introduction to the Study of Birds; or, the Elements of Ornithology on scientific principles. Sm. 8vo. Lond. 1835.
From Mr. J. H. Gurney, Jun., F.Z.S.

——— Report on the Migration of Birds. Sixth Report. 1884.
From Mr. J. Cordeaux

"Blake" Expedition. Reports on the Results of Dredging by the U. S. Coast Survey Steamer "Blake." Report on the Echini; by Alexander Agassiz. Part i. With 32 plates. 4to. Cambridge, U. S. A., 1883. *From Professor Newton, F.R.S.*

Botanical (The) Exchange Club of the British Isles. Report for 1884. pp. 20. 8vo. Manchester, 1885.
From Mr. A. Bennett, F.L.S.

Bristol Naturalists' Society. Proceedings, New Series, vol. iv. part 3. 1885. *From the Society*

Cardiff Naturalists' Society. Report and Transactions, vol. xvi. 1884. *From the Society*

Clarke (W. Eagle) and Roebuck (W. D.). A Handbook of the Vertebrate Fauna of Yorkshire. 8vo. Lond. 1881.
From Mr. W. E. Clarke

Cox (Arthur, M.A.). Bird Eccentricities in Derbyshire. pp. 3.
From Mr. G. Edwards

Cumberland and Westmorland Association for the Advancement of Literature and Science. Transactions, no. 9, 1883—84.
From Mr. H. B. Woodward, F.G.S.

Cunningham (Prof. D. J., M.D.). Report on the Marsupialia. [From the Zoology of the Voyage of H.M.S. Challenger.] 4to. Lond. 1881. *From Professor Newton, F.R.S.*

Dulwich College Science Society. Seventh Annual Report, 1884—85.
From the Society

Eastbourne Natural History Society. Transactions, New Series, vol. i. parts 6 and 8. 1885. *From the Society*

Edinburgh. Botanical Society. Transactions and Proceedings, vol. xv. part 2, vol. xvi. parts 1 and 2. 1885—86.
From the Society

——— Geological Society. Transactions, vol. iv. part 3, vol v. part 1. 1883—85. *From the Society*

——— Royal Physical Society. Proceedings, vol. viii. part 2. 1884—85. *From the Society*

Flower (W. H., F.R.S.). Recent Memoirs on the Cetacea, by Professors Eschricht, Reinhardt, and Lilljeborg. Edited by William Henry Flower, F.R.S. [Published by the Ray Society.] Folio. Lond. 1866. *From Professor Newton, F.R.S.*

Forbes (Edward). Memoir of Edward Forbes, F.R.S., late Regius Professor of Natural History. By George Wilson, M.D., and Archibald Geikie, F.G.S. 8vo. Edinb. 1861.
From Mr. J. H. Gurney, Jun., F.Z.S.

Glasgow Natural History Society. Proceedings, vol. v. part 3; and new series, vol. i. part 1. 1884—85. *From the Society*

Gunther (A. C. L. G., M.D.). The Reptiles of British India. [Published by the Ray Society.] Folio. Lond. 1864.
From Professor Newton, F.R.S.

Gurney (J. H., Jun., F.Z.S.). A Catalogue of the Birds of Norfolk. With additions and corrections [up to December, 1885]. 12mo. *From the Author*

——— Ornithological Notes from North Norfolk. [Reprinted from 'The Zoologist' for May, 1885.] pp. 4. *From the Author*

——— Are Sparrows sufficiently destructive to Agricultural Crops to be destroyed, considering the Caterpillars they eat? [Reprinted from the 'Norfolk Chronicle,' August 1st, 1885.] pp. 10. 12mo. *From the Author*

——— The House Sparrow: by J. H. Gurney, Jun., and Colonel C. Russell; and the English Sparrow in America, by Dr. Elliott Coues. Sm. 8vo. Lond. 1885. *From Mr. J. H. Gurney, Jun., F.Z.S.*

Hertfordshire Natural History Society and Field Club. Transactions, vol. iii. parts 5, 6, and 7. 1885. *From the Society*

Huddersfield: its History and Natural History. By C. P. Hobkirk. Sm. 8vo. Huddersfield, 1868. *From Mr. J. H. Gurney, Jun., F.Z.S.*

Liverpool Naturalists' Field Club. Proceedings. 1884—85. *From the Club*

London. Geological Society. Quarterly Journal. Nos. 142—163. May, 1880—August, 1885. *From Major Feilden, F.G.S.*

——— Royal Geographical Society. Proceedings, April, 1885, to March, 1886. *From Mr. H. G. Barclay, F.R.G.S.*

——— Royal Microscopical Society. Journal, second series, vol. v. parts 2—6, and vol. vi. part i. April, 1885—February, 1886. *From the Society*

——— Quekett Microscopical Club. Journal, second series, vol. ii. nos. 12, 13, and 14. June, 1885—February, 1886. *From the Club*

——— Royal Institution of Great Britain. Vol. xi. parts 1 and 2. 1885—1886. *From the Royal Institution*

——— ——— List of the Members, Officers, Professors, etc. 1885. *From the Royal Institution*

Mc Intosh (W. C., M.D.). A Monograph of the British Annelids:—The Nemerteans. In two parts. [Published by the Ray Society.] Folio. Lond. 1873—74. *From Professor Newton, F.R.S.*

Manchester Literary and Philosophical Society. Memoirs. Third Series. Vols. i.—ix. 8vo. Lond. 1862—84. *From the Society*

New Zealand Institute. Transactions and Proceedings; edited by James Hector, M.D., F.R.S. Vol. xvii. Roy. 8vo. Wellington, 1885. *From the New Zealand Institute*

Northamptonshire Natural History Society and Field Club. Journal, nos. 21—23. 1885. *From the Society*

Norway. The Norwegian North Atlantic Expedition, 1876—1878. [In Norwegian and English.] Parts 12 and 13. Folio. Christiania, 1884-85. *From Professor Newton, F.R.S.*

Contents:—

Part 12. Pennatulida, by D. C. Danielssen and Johan Koren. With 12 plates and 1 map.

Part 13. Spongiadæ, by G. A. Hansen, M.D. With 7 plates and 1 map.

Paris. Feuille des Jeunes Naturalistes. Nos. 174—185. Avril, 1885—Mars, 1886 *From the Society*

Pennant (Thomas). The Literary Life of the late Thomas Pennant, Esq.; by himself. Sm. 4to. Lond. 1793. *From Mr. J. H. Gurney, Jun., F.Z.S.*

Penzance Natural History and Antiquarian Society. Report and Transactions, 1884—85. *From Mrs. Luscombe*

Pettigrew (J. B., M.D.). On the Mechanical Appliances by which Flight is attained in the Animal Kingdom. [From the Trans. of the Linnean Society, vol. xxvi.] 4to. Lond. 1867. *From Professor Newton, F.R.S.*

Plymouth Institution and Devon and Cornwall Natural History Society. Annual Report and Transactions. Vol. ix. part 1. 1885. *From the Plymouth Institution*

Queensland. Royal Society of Queensland. Proceedings. Vol. i. parts 2, 3, 4. 8vo. Brisbane, 1884. *From the Society*

Reid (C., F.G.S.) and Sharman (G.). On the so-called "Gault" of West Dereham, in Norfolk. [Reprinted from the 'Geological Magazine' for February, 1886.] pp. 4. *From Mr. C. Reid, F.G.S.*

Russia. Bulletin de la Société Impériale des Naturalistes de Moscou. Année, 1884, no. 4. Année, 1885, nos. 1, 2. *From the Society*

Somersetshire Archæological and Natural History Society. Proceedings, 1849—50. *From Mr. J. H. Gurney, Jun., F.Z.S.*

Southwell (Thomas, F.Z.S.). Notes on the Seal and Whale Fishery of 1881. [Reprinted from the 'Proceedings of the Natural History Society of Glasgow,' February 28th, 1882.] pp. 7. *From the Author*

——— Notes on the Seal and Whale Fishery of 1882, 1883, and 1884. [Reprinted from 'The Zoologist' for April and August, 1884, and March, 1885.] *From the Author*

——— On the Occurrence of Sowerby's Whale (*Mesoplodon bidens*) on the Yorkshire Coast. By T. Southwell, F.Z.S., and W. E. Clarke, F.L.S. [Reprinted from the 'Annals and Magazine of Natural History,' for January, 1886.] pp. 7. *From the Authors*

Strickland (Hugh Edwin). Memoirs of Hugh Edwin Strickland, M.A., F.R.S.; by Sir William Jardine, Bart. Roy. 8vo. Lond. 1858. *From Mr. J. H. Gurney, Jun., F.Z.S.*

United States of America. Annual Report of the Smithsonian Institution for the year 1883. 8vo. Washington, 1885. *From the Smithsonian Institution*

——— Reports of the United States Geological Survey of the Territories; by F. V. Hayden, United States Geologist-in-charge. Vol. viii. 4to. Washington, 1883. *From Dr. F. V. Hayden*

Contents:—

Vol. VIII. Contributions to the Fossil Flora of the Western Territories, by Leo Lesquereux. Part iii.

——— Fourth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1882—83; by J. W. Powell, Director. Roy. 8vo. Washington, 1884. *From the United States Geological Survey Office*

——— Proceedings of the American Association for the Advancement of Science, Thirty-third Meeting, held at Philadelphia, Penn., September, 1884. Roy. 8vo. Salem, 1885. *From Dr. Beverley*

——— American Museum of Natural History. Bulletin, vol. i. no. 6. 1885. *From the American Museum*

——— ——— Annual Report for the Year 1884—5. *From the American Museum*

——— Second Annual Report of the Board of Trustees of the Public Museum of the City of Milwaukee. 1884. pp. 36. *From the Board of Trustees*

Woodward (H. B., F.G.S.). The Glacial Drifts of Norfolk. pp. 19. [From the 'Proceedings of the Geologists' Association,' vol. ix. no. 3.] *From the Author*

Yorkshire Naturalists' Union. Transactions, part 8. 1885. *From the Society*

——— Philosophical Society. Annual Report for 1884. *From the Society*

ADDRESS.

Read by the President, Major H. W. Feilden, F.G.S., C.M.Z.S., *to the Members of the Norfolk and Norwich Naturalists' Society, at their Seventeenth Annual Meeting, held at the Norfolk and Norwich Museum, March 30th, 1886.*

Ladies and Gentlemen—On the conclusion of my year of office, it is gratifying to be able to point to the continuous prosperity of our Society, as shown by the Treasurer's report which you have just heard read. This time last year the number of members was two hundred and fifty: we have lost by death five, by withdrawals ten; but twenty-five new members have been elected during the past twelve months, leaving a gain of ten, and bringing up the present number to two hundred and sixty; namely, sixteen honorary, twenty-three life, and two hundred and twenty-one ordinary members.

I regret that I have to report the unusual number of five deaths amongst our members during the past year, amongst whom are Captain William D'Urban Blyth, of Hill House, Dersingham, an officer who served with distinction in India, and who, on his retirement from the army in 1862, returned to his native county, where he was deservedly esteemed both as a county gentleman and sportsman naturalist. Captain Blyth died on April 21st, 1885. Sir Henry Josias Stracey, Bart., one of our Vice-Presidents, died at Rackheath, on August 7th last, having just completed his eighty-third year. Although he had never taken a very active part in the work of the Society, he, like Lady Stracey, whose death we had to record in our last year's address, always evinced a deep interest in the objects we have in view, and was one of the earliest

members enrolled in our ranks. In Mr. Edward Field, who died on February 14th, 1886, we have to regret the loss of a citizen full of years and honours, who also took considerable interest in the progress of our Society, and frequently joined our summer excursions, as did also Mrs. Fitch (the wife of our old and esteemed member Mr. Robert Fitch), who died August 10th, 1885. Mrs. Fitch, however, evinced the greatest interest in the archæological and palæontological pursuits with which her husband's name has for so many years been honourably connected.

I need not enumerate the papers which will be published in the 'Transactions,' but will refer in the briefest possible terms to a few others which have been read at our evening meetings.

In April, Mr. Southwell exhibited some Norfolk specimens of the Edible Frog, and called attention to a very interesting paper by M. Boulenger, in which the latter shows that the race of Edible Frogs found in this county does not belong, as might have been expected, to the Belgian form, but to that now found in Italy.

At the meeting in May the Rev. E. F. Linton read a list of rare plants observed by him near Wells.

At the first autumn meeting Mr. Southwell exhibited and made some remarks on a living specimen of the Rat, known as *Mus alexandrinus*, several of which had been taken by Mr. Edward Bidwell, in Lower Thames Street. He also showed for comparison two specimens of the old English Black Rat (*Mus rattus*), which had been killed at Stockton-on-Tees in the year 1876. The little animal exhibited was about half-grown, and a very pretty creature, almost black above and dark grey on the under parts, its long tail tipped with white, and its feet flesh-coloured.

At the October meeting Mr. Stevenson read a paper on four rare birds from the collection of the late Mr. Rising, of Horsey, all killed in this county, which have been presented to the Norwich Museum, comprising the Buffel-headed Duck, the Red-crested Whistling Duck, the American Brown Snipe, and the Black Stork.

In November, the Rev. E. F. Linton read a paper on *Martynia proboscidea*, a South American plant which he had raised from

seed, and the singular fructification of which he had observed and described.

At the February meeting, Mr. J. H. Gurney, Jun., exhibited a remarkable rufous variety of the Snipe recently killed at Cromer Hall. The marked features in the bird were the general ruddy tint of the feathers, and somewhat exceptional markings on the upper portions of the back. It could not be referred, from its smaller size, to Gould's Russet Snipe, of which large race two specimens were on the table, and the opinion seemed general that it was a very interesting erythrean variety of the Common Snipe.

Within the limits of a short address it is only possible to allude in a very cursory, and perhaps unsatisfactory manner, to those highly interesting and fascinating problems which lead us to the conclusion that the advent of life occurred at the Poles of our earth. A series of very remarkable discoveries of a rich fossil flora in the most northern regions of the globe has, in a great measure, been the initial cause of such a conception; and the same line of reasoning and observation which conclusively shows how much the existing flora of the earth owes to the past Miocene flora of the North Polar regions, may be fairly used in an endeavour to elucidate the still more complicated problem, namely, the advent of animal life, which I propose to submit for your consideration. We are not indebted to the observations, nor to the theories of any single individual, however eminent, for the enlargement of our views on this subject: it is the outcome of the laborious research of many intelligent and illustrious observers. A wonderful series of facts connected with the past history of the Polar regions has been collected within the last half century, which has engaged the attention of some of the most able, intellectual, and scientific minds of our time. I cannot within the limits of my address pretend even to give a recapitulation of the names of the distinguished men of science who have given their attention to this subject, but I think those of the late Professor Oswald Heer of Zurich, Professor Asa Gray of the United States, Count de Saporta of France, and our countrymen, the late Sir Charles Lyell.

Sir Joseph Hooker, and Mr. A. R. Wallace, may with justice be placed in the front rank. To commence with, we must advance a certain number of propositions, which we may safely conclude hold good, if the code of natural laws has been uniformly in force; and as Mr. Hilton Scribner has already in his essay 'Where did Life Begin?' enunciated these with a conciseness which I cannot hope to better, I make no apology for quoting from him.

"First.—That life commenced on those parts of the earth which were first prepared to maintain it; at any rate, that it never could have commenced elsewhere.

"Second.—As the whole earth was at one time too hot to maintain life, so those parts were probably first prepared to maintain it which cooled first.

"Third.—That those parts which received the least heat from the sun, and which radiated heat most rapidly into space, in proportion to mass, and had the thinnest mass to cool, cooled first.

"Fourth.—That those parts of the earth's surface, and those only, answering to these conditions are the Arctic and Antarctic Zones.

"Fifth.—That as these Zones were at one time too hot, and certain parts thereof are now too cold, for such life as inhabits the warmer parts of the earth, these now colder parts, in passing from the extreme of heat to the extreme of cold, must have passed slowly through temperatures exactly suited to all plants and all animals in severalty which now live or ever lived on the earth.

"Sixth.—If the concurrent conditions which have usually followed lowering temperature followed the climatic changes in this case, life did commence on the earth within one or both of certain zones surrounding the Poles, and sufficiently removed therefrom to receive the least amount of sunlight necessary for vegetal and animal life."*

Such reasonings and conclusions would, however, be of no value if we admitted that, during the æons of geologic time, the axis of the earth had shifted from its present position, as some geologists

* Scribner, 'Where did Life begin?' pp. 21, 22 (New York, 1883).

have contended, for if so, what are now the Poles might have been in some very different position of the earth's surface. The theory of the non-stability of the earth's axis was advanced in order to account for the discovery of a rich temperate, or semi-tropical fossil flora, in Miocene formations, in extremely high Arctic latitudes; and though many eminent geologists have given their adhesion to the view that the ancient Miocene flora of the Polar area, owing to the absence of sunlight in winter, could only have existed under such circumstances, yet an examination into existing facts in connection with the present distribution of plant and animal life in close propinquity to the North Pole, proves to us that the long absence of sunlight during winter is no bar to its present survival and propagation, and consequently there is no reason to adduce that it ever was. To this point I will refer in greater detail later on. The theory of the shifting of the earth's axis of rotation has been exhaustively discussed of late years by several of the most eminent mathematicians of our day in Great Britain, notably by Sir William Thomson, Professor Samuel Haughton, and Mr. George Darwin. All these great authorities seem to admit the physical possibility of some change taking place in the axis of rotation by certain stupendous changes or deformations in the land surfaces in the earlier ages of our planet, but they all appear to agree that there is no evidence of such change, certainly not during geological history. It is an indisputable fact that the sequence of the geological record in the far north agrees with that of the rest of the Northern Hemisphere. We find there in the same succession the Primary or Palæozoic, the Secondary or Mesozoic, the Tertiary or Cainozoic, and the Quaternary or Post-Tertiary formations. Certainly great gaps and chasms still remain to be filled up in the succession of the geologic record; but that is not to be wondered at, when we consider that the greater portion of the Polar area is at the present time submerged, and that research has only been possible in the ice and snow clad regions of Spitsbergen, Novaya-Zemlya, Grinnell Land, Greenland, and the islands of the Parry Archipelago, mere fragments of the great land extension which in the Tertiary epoch must have occupied the Polar area. Of late

years we are indebted to Baron Nordenskiöld and his scientific companions for immense accessions to our knowledge of Polar geology, especially in Spitsbergen, Novaya-Zemlya, and Greenland. My own researches, and those of my associates, in Grinnell Land, the most northern portion of the globe in which fossil remains have been brought to light, and where the sequence of geological formations has been scientifically investigated, are of great interest, for by correlating them with geological discoveries in the Polar area on almost the opposite side of the hemisphere, we can arrive with absolutely certainty at the fact, that the Polar Sea, as known to us, must be based on the same series of geological formations which crop out on its extreme verges. Thus the great series of Silurian rocks which extend over the Parry Archipelago, North Greenland, and Grinnell Land, have their counterparts in the Silurian rocks of Spitsbergen and Novaya-Zemlya. Mr. Etheridge (Quart. Journ. Geol. Soc., 1878, p. 578), thus refers to the conditions of that Palæozoic sea, as exemplified by its fossil Sclerodermic Corals:—"These undoubted reef-forming Corals of the Silurian epoch were just as much inhabitants of warm water in northern latitudes at that period, as are the Sclerodermata of to-day in the Indo-Pacific and Atlantic Oceans; and as we know of no compound Coral that will exist at a lower temperature than 68° F., and as the surface-water under the equator in the Pacific has a temperature of 85° F., and in the Atlantic 83°, it seems clear that the range from 68° to 85° F. is best adapted to, and not too high for, the growth of the reef-making species. We may fairly assume that the temperature of the Polar waters during Palæozoic times was as high as that of the Indo-Pacific and Atlantic now where Coral-reefs abound. We are not justified in supposing that the laws regulating oceanic life were very different then from those now existing (in the same groups) under the equator or between the tropics. These Corals were forms of life which must have been tropical in habits and requirements. We know nothing of the ancient isotherms or isothermal laws that then, as now, through temperature greatly governed or influenced the distribution of life over the globe, whether upon land or in the

sea. All is not due to supposed changes in the direction of the earth's axis or place of the pole. We have yet to learn something of the physical geography of the Northern Hemisphere during Palæozoic times, and the causes that produced the high temperature of the Arctic Seas during and between the Palæozoic and Miocene periods."

I have dilated so far on the Palæozoic conditions of the Polar Sea, to show that, at that period, an ocean with a temperature equal to that of our Pacific and Atlantic, under the equator, circulated around the North Pole; and it seems quite impossible to account for the present great difference of temperature by any change in the warm oceanic currents, but that it must be due to the secular cooling of the globe, which commenced first at the Poles.

The great development of Carboniferous Limestone, with its abundant fossil remains, which I found in the most northern part of Grinnell Land, between 82° 43′ and 82° 50′ N. lat., and consequently the nearest known fossiliferous rocks to the North Pole, is underlain by Devonian rocks with fossils, which rest unconformably on Azoic beds. The strike of the Carboniferous Limestone formation of Feilden Peninsula and Cape Joseph Henry is towards Franz Josef Land and Spitsbergen, from which latter country a rich fossil fauna of the same age is known and has been described by Toula, and therefore there can be no question that Carboniferous rocks must likewise underlie the Polar Sea. Rocks belonging to the Secondary epoch, have been found in many portions of the Arctic area. Liassic fossils were long ago discovered by Lieutenant Anjou, of the Russian navy, in the New Siberian Islands; and at Point Wilkie, and other localities in the Parry Archipelago, patches of Lias with a rich fauna occur. Saurians have been discovered in Spitsbergen, in beds referable to the Trias and Lias. Saurian vertebræ were found in the Lias beds of Bathurst Island. Jurassic rocks have been examined in Alaska. On the east coast of Greenland, Payer and Copeland discovered marls and sandstones, with a fauna resembling the Russian Jurassics. Beds of Cretaceous age exist on the northern

coast of Disco Island, and the southern side of the Noursoak Peninsula in West Greenland.

No trace of Eocene marine deposits has as yet been discovered in the Polar area, which perhaps may be accounted for by the entire North Polar region having been dry land during that geological epoch; but it may also be owing to the imperfection of our geological record, and future research in the far north may reveal to us traces of an Eocene period. There is, however, no doubt that there was a vast extension of land around, and probably at, the North Pole during the Miocene period. Dr. A. Geikie writes: "One of the most remarkable geological discoveries of recent times has been that of Tertiary plant beds in North Greenland. Heer has described a flora extending at least up to 70° N. lat., containing one hundred and thirty-seven species, of which forty-six are found also in the central European Miocene basins. More than half of the plants are Trees, including thirty species of Conifers (*Sequoia*, *Thujopsis*, *Salisburia*, etc.), besides Beeches, Oaks, Planes, Poplars, Maples, Walnuts, Limes, Magnolias, and many more. These plants grew on the spot, for their fruits in various stages of growth have been obtained from the beds. From Spitzbergen (78° 56′ N. lat.) one hundred and thirty-six species of fossil plants have been named by Heer. But the latest English Arctic expedition brought to light a bed of Coal, black and lustrous like one of the Palæozoic fuels, from 81° 45′ N. lat. It is from twenty-five to thirty feet thick, and is covered by black shales and sandstones full of land plants. Heer notices thirty species, eighteen of which had already been found in the Arctic Miocene zone. As in Spitzbergen, the Conifers are most numerous (Pines, Firs, Spruces, and Cypresses), but there occur also the Arctic Poplar, two species of Birch, two of Hazel, an Elm, and a Viburnum. In addition to these terrestrial Trees and Shrubs, the stagnant waters of the time bore Water-lilies, while their banks were clothed with Reeds and Sedges. When we remember that this vegetation grew luxuriantly within 8° 15′ of the North Pole, in a region which is in darkness for half of the year, and is now almost continuously buried under snow and ice, we can realize the difficulty of the problem

in the distribution of climate which these facts present to the geologist."*

I must, even at the risk of detaining you longer than I could have wished, refer to some of the late Professor Oswald Heer's remarks on the collection of Miocene plants that I made in Grinnell Land, for they have a most important bearing on the main point of my address to you this evening. "The Cupressineæ are represented in Grinnell Land only by a *Thuites* (*T. Ehrenswärdi*, Heer), fine twigs of which were found in King's Bay, Spitsbergen (lat 79° N.), but has only reached us from Grinnell Land in the form of one small fragment which cannot be determined with perfect certainty. On the other hand, the leaf-covered twigs of *Taxodium distichum miocænum*, which is one of the most abundant plants of Grinnell Land, and appears in many varieties, are most beautifully preserved. Fortunately we have it in a state of bloom from this place, as from Cape Staratschin, viz., the male flowers, which completely correspond with those of Spitsbergen. They show that this remarkable tree, now existing only in the United States, and in Mexico, lived and bloomed during the Miocene period almost as far north as 82°! . . . It is a very interesting fact that in Grinnell Land two twigs of the Spruce (*Pinus abies*, Linn.) still covered with leaves were found. I had already received single detached leaves from Spitsbergen; with them were seeds of this species, and further, there was also found a scale of the cone, so that the species could be determined with perfect certainty. We therefore see that our Spruce (Red Fir) was living during the Miocene period in Grinnell Land as well as in North Spitsbergen, and at that time doubtless extended as far as the Pole, at least if any dry land then existed there. In Europe the tree did not then exist; hence very probably it had its original home in the extreme north, and has thence extended southwards. We first meet it in Europe in the Forest-bed of the Norfolk coast, and in the interglacial deposits of lignite in Switzerland. At that time, therefore, it had come into our regions, and has ever since formed a principal constituent of our forests. Its extreme northern limit is now in

* 'Text Book of Geology,' p. 868.

Scandinavia, 69½° N. lat.; and it is now spread over about twenty-five degrees of latitude, whilst during the Miocene period it was limited to the Arctic zone. . . . That the flora of Grinnell Land approaches much more closely to that of Spitsbergen than to that of Greenland, is easily intelligible from the greater difference of latitude. The plant-bearing locality of Grinnell Land lies much nearer to the north-west of Spitsbergen (Ice-fiord and King's Bay), than to Disco, and the opposite peninsula of Noursoak, which have furnished the Miocene plants of Greenland. We have previously pointed out (Flora Foss. Arctica, vol. ii. p. 16) that the Miocene flora of Spitsbergen, as compared with that of Greenland, would seem to indicate considerable climatic difference, inasmuch as a great number of more southern forms which Greenland possesses—such as *Castanea*, evergreen *Magnoliæ*, *Prunus*, *Ilex*, *Mac Clintockia*, and *Coccolites*—are wanting in Spitsbergen. The same holds good with regard to Grinnell Land."*

Thus Heer conclusively shows that the Miocene flora increases both in genera and species as we trace it from the 82° of north latitude to that of Switzerland; or in other words, that there is a thinning out of genera and species as we approach the North Pole. As this decrease of species is alike in the deposits both of Grinnell Land and Spitsbergen, situated on opposite sides of the hemisphere, it is evident that it cannot be due to any change in the geographical position of the Pole,—unless we admit the fanciful theory of an oscillation of the Pole to suit each case,—but is due to climatal conditions which even in the Miocene period asserted themselves at the North Pole. Therefore, though the temperature of the Polar regions at that time must have been considerably higher than now, yet the Miocene flora decreased towards the Pole in the same manner as the flora of to-day; and it is difficult to escape from the conclusion that this points to a gradual refrigeration of the North Pole, extending through geologic time, owing to the secular cooling of the earth mass, and the radiation of its heat into stellar space.

We find Miocene plant-bearing beds on an immense scale in the

* Heer, Quart. Journ. Geol. Soc., 1878, pp. 66-70.

neighbourhood of Disco, North Greenland, in 70° N. lat., again in Grinnell Land in 81° 43′ N. lat., in Spitsbergen in 79° N. lat., in Alaska, and in Iceland. Probably Bennett Island, lying to the north of the New Siberian Islands, is also of Miocene age, judging from the description given of it by the gallant and unfortunate De Long.* Thus, at various points around the Polar basin, evidence of a great land extension in Miocene times is proved to have existed: that great land surfaces occurred, is shown by the arboreal and plant remains that have been discovered and described. It is impossible therefore to doubt that the land in Miocene times had a vast extension, probably extending over the North Pole itself. Unfortunately, no Miocene strata have yet been discovered in the Polar area containing mammalian or vertebrate remains, but there is no reason why the labours of future explorers may not be rewarded by their discovery. That the Miocene arboreal vegetation originated at the Pole, and spread southwards, appears impossible to doubt, when we reflect over the instances which I have quoted on the authority of Heer, of the *Taxodium distichum miocenum*, which still exists in Mexico, which is found fossil in Grinnell Land, and in Spitsbergen, and which in Miocene times extended as far south in Europe as Central Italy. Again, that *Pinus abies* should have grown in Miocene time in N. lat., 81° 43′, that it did not extend then to temperate Europe, where it now forms one of the principal constituents of our modern forests. But it is unnecessary for me to urge this view further, as these doctrines of Heer are accepted more or less in their integrity by the greatest and most philosophic of living botanists. The main opposition to the speedier adoption of Heer's philosophic views arose, I think, from the difficulty in realizing that a rich arboreal vegetation could exist in a portion of the earth, where for nearly six months of each year the sun is below the horizon. This objection is more apparent than real, and does not stand the test of practical experience. I must therefore refer briefly to this vexed question.

The difficulty advanced of accounting for animal life, and a rich and diversified vegetation existing at the North Pole through the

* 'Voyage of the Jeannette,' vol ii. p. 661.

long darkness of winter, has been a stumbling-block to many geologists. If, however, we are willing to accept existing facts, all cause for astonishment disappears. To-day in Grinnell Land, on the very same area where in former ages this luxuriant Miocene vegetation flourished, and where now the mean annual temperature is more than three degrees below zero of Fahrenheit, there exists a very considerable phanerogamic vegetation. We find some sixty flowering plants in Grinnell Land, whilst a tree-shrub, *Salix arctica*, grows in sufficient abundance to form the principal food of considerable herds of ruminants, namely, the Musk-Sheep (*Ovibos moschatus*), an animal not inferior in size to the small Highland cattle of North Britain. When the Miocene flora flourished in Grinnell Land, the climate there must have been as genial in winter as that of England now is; probably more so; and if under existing conditions of temperature, and the same prolonged absence of the sun below the horizon, we now find in Grinnell Land shrubs and plants flourishing, whilst the Musk-Sheep, the Arctic Wolf, the Arctic Fox, the Ermine, with countless thousands of Lemmings live there throughout the year, and propagate their species, then surely we ought to admit, that granting the Polar area the present climate of Florida, the Magnolia, the Live Oak, and the Orange might flourish at the North Pole to-day.

If the period of one hundred and forty-two days, during which the sun is below the horizon in Grinnell Land, was a season of continuous darkness, black as an unlighted coal-pit, then we might fairly wonder how plants and animals could exist there; and as there seems to be with many persons a very great misconception on this subject, I will give a few facts from my own experience, which perhaps may enable us to better realize the conditions of light and darkness, during the winter months, at a position on our globe only four hundred and fifty miles from the North Pole.

The sun sunk below our horizon at Floeberg Beach on the 12th of October, and re-appeared on the 2nd of March, a period of only twenty-nine days less than its calculated disappearance at the North Pole. On the 30th November, with a perfectly clear sky, from a distance of half-a-mile in a southerly direction, the ship was visible

from 11 a.m. to 1 p.m. At noon, just topping the southern hills, was a faintly tinted pearly green sky, through which stars of the first magnitude had a difficulty in shining. On the 12th of January, at noon the sky close to the horizon displayed a decided tint of green, the first we experienced from the returning sun. On the 24th of January, the twilight at noon had increased sufficiently to enable us to distinguish a comrade at a distance of one hundred and twenty-five yards. By the beginning of February, a month before the re-appearance of the sun, we were able to take walks of considerable extent; and by the middle of that month we were carrying our guns in pursuit of game. We must also remember that, during the periods the moon is above the horizon, owing to the extreme dryness of the atmosphere, she shines with greater brilliancy, than ordinarily, in our humid climate. This, with the starlight, enabled us to continue our walks through the greater part of the winter, and to see for miles around us. Still more suggestive is the fact, that Major Greely discovered the remains of Eskimo settlements in the interior of Grinnell Land, around the shores of Lake Hazen.

During my winter's residence in Grinnell Land, I obtained ample proof that animals were on the move the whole time. In the beginning of February, with the temperature eighty to ninety degrees below the freezing-point of Fahrenheit, the Lemmings were peering forth from the snow, and the contents of their stomachs showed they had been feeding on *Saxifraga oppositifolia*. This interesting, and in Grinnell Land, abundant plant, on spaces bared by the wind, and consequently exposed to a temperature as low as seventy degrees below zero, showed throughout the winter a small green bud at the extremity of each stalk, inside of the russet-brown, hair-fringed leaves. With such facts as these, we may safely assume that the paucity of Polar life at the present day is entirely due to temperature.

If I have succeeded in proving that the existing conditions of light and darkness in the highest latitudes are no bar to the existence of animal and vegetable life, I ask permission to present a more hypothetical train of argument, namely, whether we may

not adduce from the scantier series of facts at our command some reasons for assuming that the North Polar area was the "Mother Earth" of a portion at least of our present terrestrial animal life. In prosecuting this line of argument we are at once brought face to face with the fact that, so far, our researches in the Polar area have not brought to light any Miocene or Pliocene formations that contain remains of vertebrate fauna. Such negative evidence is probably due to the paucity of our explorations. It seems to me that most important and valuable results must accrue from a scientific investigation of the fossil vertebrate remains which we know are deposited in wonderful profusion in the New Siberian Islands, in the Arctic area. The discovery of a fossil twig of *Pinus abies*, in Grinnell Land, enabled Heer to demonstrate with certainty that the tree had its origin at the North Pole, and extended itself to the temperate zone. The discovery of some unexpected fossil form in the New Siberian Islands may throw an equal light on the southward distribution of animals.

The researches of Heer and Saporta show that a considerable proportion of the existing flora of the earth had its prototypes, and in some instances the actual species, growing in the Polar area during Miocene times, when at the same time such species had not then invaded the north temperate zone. It is therefore a reasonable surmise, that the same laws which guided the migration towards the Equator of vegetable forms equally affected terrestrial animal life. The only actual basis of fact that at present we have at our command is, that certain mammalian forms, not at present inhabiting the temperate zone, are arctic and circumpolar in their distribution, except when in recent geological times they invaded parts of the present temperate zone, under climatic conditions similar to those now existing in the Polar regions, and have presumably travelled northwards again with the recession of the Glacial episode, or, like our Alpine Hare, have been stranded as it were, by geographical causes. I allude, particularly, to such terrestrial forms as the Polar Bear, the Arctic Fox, the Ermine, the Arctic Hare, the Musk-Sheep, and Reindeer. We may reasonably argue that the Musk-Sheep, for instance, did not

originate in the warm regions of the earth, and migrate to the inhospitable regions around the North Pole. We are acquainted with endless forms of life, both from palæontological research and present experience, which have become degraded owing to inevitable circumstances, or have succumbed in the struggle for existence; but I am unacquainted with any facts that lead us to suppose that animals have willingly exchanged a presumably better for a more antagonistic sphere of existence. The Musk Sheep that now exist in large numbers in Grinnell Land, within five hundred miles of the North Pole, are not confined there by any geographical necessity: they could retreat to more hospitable lands, if it suited them. On the other hand, if we regard the Musk-Sheep as an animal whose ancestor originated in the Polar area, when a temperate climate existed there, and through the change of climate, and the incidences of natural selection, and the survival of the fittest, evolved itself as a creature capable of supporting the vicissitudes of glacial existence, we have, I venture to submit, a more reasonable theory than that this circumpolar animal should have originated in the warmer regions of the earth, and migrated to its present habitats. The Pinnipedia, which comprise the amphibious Seals and Walruses, and which animals have their chief development in the Arctic and Antarctic regions, seem another case in point. The presumption is, that the Pinnipedia derive their origin from carnivorous land animals, and that they have adapted themselves to an amphibious existence. No fossils have been discovered in the warm regions of the earth that illustrate the incoming of the Seals: they appear first in the Miocene formations, as highly specialized creatures. It appears as probable that our northern Seals originated in a Polar land, and were forced to an amphibious existence, as that they originated in the warmer regions of the earth and spread northwards.

A very suggestive case in point is that of Steller's Rhytina. The history of the discovery of that very curious and highly specialized animal at Bering Island in 1741, and its rapid extinction, are facts doubtless well known to most of you here present. But I would more especially refer to its very remarkable

geographical distribution. As far as we know, this Sea-Cow was confined to a limited area in Bering Sea; and we are indebted to the Russian naturalist, Steller, for almost all that we know of its habits. That this animal was out of place in the cold waters that surround Bering Island is evident from the narrative of Steller. It got badly cut and bruised by the ice, and in winter became so lean that it was possible to count its vertebræ and ribs. Living as it did on the sea-weed attached to the shore, it was evidently unsuited to cope with the rigours of a cold sea and frozen littoral. Is it likely that this Sea-Cow left the warm tropics to endure the cold of Bering Sea? I think not. More probably it was originally an inhabitant of a Polar sea, in warm Miocene times, and retreated through Bering Straits, driven southward by the freezing of the Polar area, its southward extension possibly being limited by the absence of the sea ware on which it existed.

In the Arctic regions we find among the birds two species of highly specialized Gulls, circumpolar in their distribution, and only appearing by accident as very rare stragglers in the temperate zone. I refer to the species *Pagophila* and *Rhodostethia*. The same train of reasoning as applies to the mammals, may with equal force be adduced in favour of their origin in the same area. Similar views to these I enunciated some eight years ago in the pages of a Zoological magazine;* and lately, in the same journal, the well-known ornithologist Mr. Henry Seebohm has published a paper,† pointing out that the distribution of the species in the genus *Hæmatopus*, or Oystercatchers, can only be satisfactorily accounted for by the supposition that the common ancestor of the Oyster-catchers was an inhabitant of the North Polar area. He remarks in the conclusion of his essay: "We can trace almost with certainty the routes which the various parties took on their emigration from the shores of the Polar basin." Did time permit, I could offer for your consideration numerous analogous arguments.

If this theory of the existence of a Polar continent in Miocene

* 'The Zoologist,' 1878.

† *Ibid.* 1880, pp. 41–49.

times be a correct one, and that from it was derived part of the flora and fauna which now tenant our earth, it doubtless also afforded the highway for the translation of animal forms between the two Continents referred to by Wallace, who, in his great work ('The Geographical Distribution of Animals,' vol. i. p. 142) in summing up the general relations of the extinct Tertiary Mammalia of North America and Europe, draws this memorable conclusion:—"If then the facts at present known represent approximately the real time-relations of the groups in question on the two continents, they render it probable that Weasels, Bears, true Horses, Swine, Oxen, Sheep, and Antelopes, originated on the Old World continent, and were transmitted to America during some part of the Miocene period; while Camels originated in the New World, and somewhere about the same time passed over to Europe. Of the genera common to the two countries, almost all seem to have had a European origin, the only genera of equal date being the two Rhinoceroses and three Anchitheridæ; but if the Brontotheridæ are allied to the Rhinocerotidæ, these latter may have originated in America, although now an exclusively Old World type." I will, however, candidly admit that the theory I have here advanced in regard to the distribution of these animal forms is mainly based on hypothesis, but still I think one deserving of your reflection; for if I have offered you a paucity of facts, it is possible that my theories may induce some amongst you to consider the subject, with the result of adducing fresh facts to support it. This much may be said in favour of the argument, that such facts as are known do not seem to contradict it.

If we accept as a fact the existence of a Polar continent in Miocene times around the North Pole, such a land surface must have exercised a most potential effect during the later periods of geological time, as a surface for the accumulation of snow and ice around the North Pole; therefore it appears to me incumbent that I should allude as briefly as possible, to that important episode in the recent geological history of the northern hemisphere which is styled the Glacial epoch, and which undoubtedly has

been a potent factor in dispersing southwards the Polar flora and fauna. It appears to me that we are inclined at times to refer somewhat vaguely to this Glacial extension, as if we were acquainted with it as an ice-cap that embraced in its solid folds the entire circumference of the northern hemisphere, to a very low latitude. But what are the actual facts? Dr. Archibald Geikie thus summarizes the area over which the action of the Glacial period may be traced:—"It reached such a height that the whole of the north of Europe was buried under snow and ice, extending southwards even as far as Saxony. The Alps and Pyrenees were loaded with vast snow-fields, from which enormous glaciers descended into the plains, overriding ranges of minor hills on their way. The greater part of Britain was similarly ice-covered. In North America also, Canada and the Eastern States of the American Union, down to about the thirty-ninth parallel of north latitude, lay under the northern ice-sheets."* Accepting this description as an outline of the area over which the great Glacial episode extended in the northern hemisphere, we find, roughly speaking, that between the fortieth meridian of east longitude passing through the White Sea, and the 160° of west longitude passing through Alaska, but separated by the expanse of the Atlantic Ocean, is included all that portion of the northern hemisphere which presents us with proofs of that abnormal extension of ice which we style the Glacial epoch. Great as this extension of the Glacial episode was, it is only fair to point out that from the Kola Peninsula in 40° east longitude to Bering Straits, the vast tundras of Siberia, extending through one hundred and fifty degrees of longitude, do not appear to present any traces of that abnormal ice episode which is so remarkably impressed on north-western Europe, and the northern part of America. On this point we have the authority of the most competent of observers, Baron Nordenskiöld, who in 'The Voyage of the Vega' frequently refers to the subject, and writes:—"It is certain that the ice-cap did not extend over the plains of Siberia, where it can be proved that no ice age, in a

* Geikie, 'Text Book of Geology,' pp. 883-84.

Scandinavian sense, ever existed, and where the state of the land from the Jurassic period onwards was indeed subject to some changes, but to none of the thorough-going mundane revolutions which in former times geologists loved to depict in so bright colours."*

There is consequently no evidence for assuming that, during the extension of the Glacial episode in Scandinavia, Great Britain, and North America, the climate of Siberia differed very greatly from what it is now. Presumably it must have been warmer, for the land at that time supported vast herds of Mammoths, Rhinoceroses, and other large mammals whose remains are found in the tundras of Siberia, and the more northern New Siberian Islands; and doubtless, then as now, the discharge of heated water from the rivers of northern Asia kept back the Polar ice. If we are correct in assuming that one half of the northern terrestrial hemisphere shows no trace of the extension of the glacial ice-cap—and the evidence at our command appears to be conclusive on this point—whilst the other half does, we can hardly rely on the theory, that changes in the eccentricity of the Earth's orbit, even with the indirect physical agencies thereby engendered, could account for the Glacial epoch in north-western Europe and North America. If the Glacial epoch was due to incidences connected with the eccentricity of the Earth's orbit, surely the extension of the glaciated area in the northern hemisphere would have been circumpolar, and not semi-spherical. We must therefore look to a solution of the problem by changes in the relative positions of land and water.

The existence of a Miocene continent in the area now occupied by the Polar basin seems to be highly probable. There is certainly some evidence that the Tertiary area extended from Greenland, through Iceland and the Færoe Isles, to our Hebrides. Such a distribution of land would have barred, or greatly limited, the ingress of the Atlantic waters. As a result of the secular cooling of the globe during the Miocene and Pliocene periods, the Pole would certainly become the first part of our northern hemisphere

* Nordenskiöld, 'Voyage of the Vega' (Eng. Edition), vol. ii. p. 256.

to feel the effects of glaciation. If instead of a sea-surface as now exists, and which removes to, and dissolves in more southern latitudes, the ice and snow of the Polar basin, the precipitation of frozen vapour was on a continental area at the North Pole, the result in the course of time would be as enormous an accumulation of ice there as we now find at the South Pole. Under such circumstances, the extension of the ice-cap over Scandinavia and Great Britain would not be difficult to conceive, when we have before our eyes the great island-continent of Greenland, lying to a great extent in the same parallels as Scandinavia, clad with an ice-cap on as gigantic a scale as we need imagine ever existed in north-western Europe. If we fix our attention on a map of the northern hemisphere, and trace on its surface the area in north-western Europe where evidences of the Glacial epoch are certainly to be found, the observer cannot fail to be struck with the relatively insignificant proportions of that area, when compared with the great land-masses of Europe and Asia, north of the fiftieth parallel, which shows no sign of an abnormal Glacial episode. If the present Atlantic currents were changed so as to divert the cold Polar current from the east coast of Greenland to the North Cape of Europe, and then continue its course along the west coast of Norway, Shetland, and the Hebrides, whilst the Gulf Stream bathed the east shores of Greenland, Scandinavia would be glaciated, and East Greenland would doubtless enjoy, as far as 70° N. lat., the present climate of Norway; whilst if a land area prevented oceanic circulation around the North Pole, and barred out the heated waters of the Atlantic, Scandinavia would be glaciated as well as Greenland.

Admitting the existence of a Polar Miocene continent, we can easily conceive that, during the long period of geologic time represented by the Pliocene epoch, the accumulation of snow and ice-cap must have been enormous, until at length the Polar land, oppressed by its superincumbent weight of glaciation, gradually sunk, and admitted the waters of the Atlantic Ocean to the Polar

basin. That this is not an idle assumption is evidenced by the fact that South Greenland is now an area of depression. As the sea gained upon the land, the ice-cap would dissolve in the ocean, the border coast-lands which supported plant and animal life would eat their way slowly inland. Again we must assume that the depression of the land reached its maximum, still leaving the mountain tops as islands above the level of the sea, and upheaval commences. That the process of upheaval is now in progress in all circumpolar lands from which the ice-cap is removed is indisputably proved. In Grinnell Land, in the islands of the Parry Archipelago, in Spitsbergen, where the land is rising with such rapidity, that where the Dutch and English whalers floated and flensed their prey, less than three hundred years ago, is now dry land. In Novaya-Zemlya, it has been calculated that there has been a rising of the sea-bottom to the extent of one hundred feet in less than three hundred years, or at the rate of thirty-three feet in a century.

The same process of upheaval is recorded by every observer in the Polar area. Granting that the rate of emergence is greater relatively than the superimposing capacity of glacial precipitation, the land would appear with its higher portions clad in snow and glacier-ice, whilst the freshly emerging land would again be re-clad with the old plant-life, and its animals would enjoy a more extended range, until again the process of upheaval closes, and the ice-cap once more reasserts the mastery. That a series of events such as I have endeavoured to describe is now in process in high Arctic latitudes was impressed on me during my stay in Grinnell Land. My own observations there are fully confirmed and enlarged by those subsequently made by Major Greely, U.S.A., who thus describes the orographical features of Grinnell Land:—"There exists from Robeson and Kennedy Channels westward to Greely Fiord and the Polar Sea a series of fertile valleys, clothed with vegetation of luxuriant growth, whereon pasture large herds of Musk-Oxen. Over a hundred of these interesting animals were killed, and over two hundred others were seen. The boundaries of

this fertile region are equally extraordinary. To the northward an ice-cap of several thousand square miles bursts through every gap in the Garfield and Conger mountains in the shape of large glaciers, one of which, Henrietta Nesmith, has a front of five miles and a perpendicular face from one hundred and fifty to two hundred feet high. . . . The unexpected and unfavourable orographical features in Greenland which disappointed Nordenskiöld in his search for such physical conditions a thousand miles further south, here likewise prevail over the ice-clad country, but give way in the fertile belt. The winter's scanty snow scarcely covers this favoured country, while its abrupt intersecting fiords and deep narrow valleys offer most favourable conditions for the action of the constant summer sun and the complete drainage of its rapid torrents." * In a paper on "Inter-Glacial Epochs," which the Royal Dublin Society did me the honour to publish in 1878, I pointed out the extraordinary difference now existing between the fertile belt of Grinnell Land and the opposite shore of Greenland now covered by a *mer de glace*. Taking into consideration the proofs of very rapid upheaval in Grinnell Land, drift-wood at a height of five hundred feet still retaining its power of flotation, and beds containing the remains of Mollusca now found in the adjacent sea, in a state of wonderful preservation, at altitudes of over a thousand feet, the conviction is forced upon me, that this extraordinary state of things in the most northern region of the earth yet explored by man, is due to the rate of emergence of the land exceeding the growth of the descending ice-cap.

I am afraid that, in giving this slight sketch of my views on the Glacial epoch, I have somewhat digressed, but in doing so I have endeavoured to show that a Glacial episode would be the natural sequence of a large continental area occupying the present Polar Basin. The question of the spreading southward of the flora and fauna from the Polar area is so intimately connected with it, that it appears to me almost impossible to avoid this subject. My

* Greely, Annual Address, Scot. Geo. Soc. 1885.

endeavour this evening has been to draw your attention to the following points :—

That through the secular cooling of our Planet the Poles became first fitted for the reception of life.

That in Palæozoic times the North Pole possessed a climate as warm, at least, as that now enjoyed at the Equator.

That the temperature at the North Pole during the Miocene period, though gradually cooling, supported a flora which has spread southwards.

That in all probability animal life likewise originated at the Poles, and spread towards the Equator.

That the difference of length in day and night at the North Pole is not now, and need never have been, a bar to the existence of plant and animal life there, and that the abnormal extension of the northern ice, during the Glacial episode, was due to the accumulation of snow and ice-cap on the old land-surfaces around the North Pole, and its retreat, to the depression of the land, and the influx of the warm waters of the Atlantic to the Polar Basin, and consequent removal of glaciation ; whilst a continuous rise of the land, and consequent shutting out of the oceanic waters, would in the course of time reproduce another Glacial epoch.

I.

CROSSBILLS NESTING IN SUFFOLK.

By Frank Norgate.

(Communicated by *The President.*)

Read 26th May, 1885.

About the 2nd of March, 1885, I was told of a Crossbill's nest two miles from my house near Brandon. The old birds had been seen picking the frayed ends of a cord which was strained between trees to dry clothes on. The Crossbills were probably lining their nest with the "linen-line" in February.

This would have been a good date to reckon from for taking a full clutch of eggs ten days later, one of the best egg prizes one could hope to take in this neighbourhood; but I was unable to attend to it until the 13th of March, when I went to the spot and saw the nest at the top of a tall bare-stemmed *Pinus sylvestris*.

Whilst standing under the tree I saw two old Crossbills fly into the nest together; they remained there just long enough for me to use a telescope, and to distinguish with its help their crossed mandibles as they emerged. They were probably feeding young ones.

On the 21st I tried in vain to climb the tree, which was so shaggy with loose thin scales of bark, that it was as slippery as a greasy pole.

On the 23rd I obtained an unfledged nestling Crossbill, one of three which were taken the day before by a boy from a nest in the top of an oak about a quarter of a mile from the other nest. The boy told me there were three old birds at the nest, two hens and

one "gay" cock with much red in its plumage. The throat of this nestling contained several seeds which I believe to be those of *Pinus sylvestris* divested of their skins, which seeds they resembled in size, shape, colour, and odour of turpentine.

I picked up this nest from the ground under the oak where the boy had left it. It is large and very thick and warm, chiefly composed of hemp-like fibre, probably the inner bark of lime twigs, and most likely stolen from the lining of a Squirrel's nest. On the same day I saw two Crossbills near the nest in the Scotch fir: they were very busy among the cones, the scales of which they split and tear without breaking them from the cone, though they break the cones off from the trees and drop them on the ground. The next day, with two ladders lashed together, I fetched down the nest from the fir-tree. The young had left it, evidently not many hours before.

This nest was much like that of a Greenfinch, and quite different from that in the oak; smaller, and built chiefly with dry twigs and moss. The young one from the nest in the oak had unfortunately been given to a cat, and had lost the tip of the upper mandible before it came into my hands.

Crossbills are well known about here to some of the few natives who take an interest in birds, by the name of "Robin-hawk." A pair is said to have been shot from a nest in a Scotch fir (several years ago) near the one where I saw the nest above described. I believe there were, at least, three pairs of them here last March.

II.

HERONRY ON THE DANUBE.

By J. Young, F.Z.S.

Read 27th October, 1885.

After a sound sleep we were up at three a.m. Our bed was a little hay spread over the floor of the araba.* The gray dawn was just breaking, a few stars still lingered in the sky, and the air was full of the songs of the yet invisible Larks,† and redolent of wild Sothernwood, which, mingled with many brilliant flowers, carpeted the treeless steppe. We were soon *en route*, and as the heavy mist melted before the rising sun, glimpses of enormous hares hurrying from our path crossed our vision.

At five o'clock we reached Gropa Cobanlin, a large Wallachian village, not far from Hirsova on one of the mouths of the Danube. It contained about a thousand inhabitants. The houses were built of sun-dried bricks: some few were tiled, but most of them were thatched with reeds, as is usual in the villages. The orchards were surrounded by neat wattled fences, and contained apple, pear, apricot, peach, and cherry trees. It boasted, too, of an inn, the first we had met with since leaving Rustendzic four days before. Here we unpacked our provisions, bread and onions, off which, with a little milk, we made our breakfast. At seven we walked down to the river, *en route* for the Heronry. Whilst the boat was being got ready, we noticed a number of logs of wood, about fifty of them, a few yards from us. These logs were merely sections of the trunks

* A native wagon. It reminded me of the old-fashioned oblong washing tubs enlarged, on four wheels, and entirely devoid of springs.

† Four species, Calandra, crested, short-toed, and sky, the last named being by far the best songster.

of trees, about eighteen inches high and from eight to twelve in diameter, hollow, with a lid on the top. On approaching nearer, we perceived a small hole in each log, through which bees were coming and going. A native noticing our curiosity, quietly took up one or two and brought them to us, turning them upside down to show us the combs; for they were simply bee-hives, about to be taken down the river to some flowery spot, where they would gather honey all day and be brought home at night. The bees were evidently accustomed to this sort of handling, as they did not seem in the least disturbed by it. The boat being now ready, we embarked, and were off at once. After rowing along the stream for about an hour, we entered a swamp of reeds and willows. The country for miles round was flooded, and by what instinct the men found their way is to me a mystery. At times we supposed we were following the course of a stream, from the fact of being hedged in with lines of willows on each side; at others we appeared to be on a lake, with a broad expanse of water of half-a-mile in extent. The depth of the water varied considerably. Sometimes the roots of the willows were visible; at others we were rowing over or through their tops; anon we were hauling the "caique" over the shallows. These caiques, though clumsy boats, are well adapted to the rough work to which they are subjected. I well remember on one occasion, whilst rowing through a semi-submerged forest, the caique stuck fast between two trees, and the united efforts of passengers and crew could not move her, so we had recourse to the axe. Whilst the men were cutting down the tree I had a very pleasant half-hour with a pipe. There was only about a foot of water just there; and as I was wearing a pair of "Field" boots, I contemplated the novelty of the scenery with perfect enjoyment, at least, as perfect as the mosquitos would permit. But to return to our voyage. Presently we came to a dense forest of reeds, through which we slowly forced our way. We were now kept in a continual state of excitement by ducks of many species rising on every side, but owing to the thickness of the reeds none were brought to bag. Twice we got unsuccessful shots at swans (*C. olor*). At length, after a four hours' row, we entered a forest of willows: the trees were not so close as to prevent our getting along comfortably: they were from ten to twenty feet in height. Ere long we came upon a colony of large

nests in the trees, but destitute of birds: these were the nests of the Common Cormorant (*P. carbo*) of the previous year; they are said to choose a fresh site every season. A profound quiet prevailed, broken only by the splashing of the oars or the exclamations of the boatmen. Occasionally we caught sight of a Cormorant or Heron wheeling overhead, but there was nothing to give us the slightest idea that we were close to a colony of at least a thousand birds. A few minutes later we hear voices of birds getting louder and louder, till they become a perfect babel of cries and screams. Now we are in the middle of them. What an extraordinary sight presented itself to our delighted eyes. Trees crammed with nests from the waters' edge to the top, clouds of screeching birds wheeling overhead, and then—the stench!

We were soon scrambling in the bushes, passing the eggs to the boat in our hats, taking notes, etc. The water being from six to eight feet deep, we could not use our wading trousers. Meanwhile I counted twenty nests in one tree, nor was that uncommon. They consisted of the following species; viz., Common Heron (*A. cinerea*), Squacco (*A. ralloides*), Lesser White Egret (*A. garzetta*), Night Heron (*N. griseus*), Pigmy Cormorant (*P. pigmeus*). Some few of the Night Herons had just hatched, but most of the eggs were fresh. We took three clutches of the Common Heron which were quite fresh. This is curious considering the date (June 12th), as I have seen young Herons in England on 23rd February;* but on the other hand, I took a clutch of four fresh eggs in Scotland on the 2nd June, 1885, though there most of the nests contained fully fledged young ones. We took a good supply of eggs of all five species, at least I believe so; for I am convinced that the eggs of the three smaller species cannot be positively separated, unless properly identified. In the present instance I regret to say that, owing to the impatience of one of the party, the identification was far from satisfactory. After shooting one or two Pigmy Cormorants we left the noisy colony, and came to an anchor in an open spot where we could get both air and shade whilst we ate our lunch. A colony of Common Cormorants was reported to be breeding within half an hour's row, but being beguiled to go in search of Purple Ibises we did not visit it.

* 'Zoologist,' 1884, p. 191.

After a fruitless search after the Ibises we turned our boat homewards. On the way we came upon a nesting colony of Black Terns. The nests were floating amongst the masses of dead drifted reeds, and the eggs were for the most part just hatching. Black-headed Gulls were breeding also. We saw two species of Grebes (*cristatus* and *griseigena*). A Gadwall was bagged; and we got a shot at an Eagle, who, however, merely shook himself and went off. We arrived home at eight o'clock, and, after supper and a pipe, were only too glad to "turn in."

NOTE.—The above paper has not been revised by Mr. Young, as he is absent from England. [ED.]

III.

A FEW PORTUGUESE NOTES.

BY O. CORDER.

Read 24th November, 1885.

IT may be thought that the Norfolk and Norwich Naturalists' Society has sufficient scope in its own county without taking other parts of England, if so, certainly it is much more out of place to receive "a few short notes from Portugal." My excuse is this, that I was so pleased myself with the country, the climate, the people, the animal and plant life, that I thought a short paper on the subject might be acceptable to you this evening. If the Moor, who so many years held sway in the Peninsula, were now to come back and visit the scenes of his former triumphs and occupation, he would find much to remind him how little had changed during the past three hundred years. The names of the people as De Moura,

of the towns as Monta de Moura, Fonta de Moura, and a host of others, the peculiar flat roofs of houses, the manners of the peasants, especially removing the shoes on entering church, the pitcher still carried to the old Moorish fountain, the short baggy trousers, and bare legs of the men, the turbaned head-dress, and the faces of the women, would all remind him that he had left his mark, and that not easily eradicated. Nay further, if the old Roman mentioned by Tacitus were to come back, he would find the remains of his villa near Braga, the vines still festooned to the trees, the winepress, the olive yards and olive press, but little altered; the self-same pattern for the yokes of the oxen, with the same huge horns nearly six feet across, the goad after his own pattern, and above all the ox cart with its cumbrous, entire, and ungreased wheels, all much about the same as two thousand years ago.

Portugal as a country has changed but little, indeed less than any other in Europe, and from its nature will ever present a most fertile field for the naturalist. A large amount of its surface can never be cultivated, and a great deal more of it can only be partially tilled. We find vast ranges of moorland teeming with Heaths, Droseras, Gnaphaliums, and Cistus, in varied and most beautiful colours of white, pink, and shades of yellow—rich plains with marsh ground full of bog plants. Also high rock districts abundant with Alpine and Sub-alpine flora; and beyond these, high mountains, the tops of which are snow clad during most of the summer, under whose slopes are found some of the rarest Narcissus not yet found in English cultivation.

When the Wolf desired a meal off the Lamb, the excuse was: "You have fouled the stream and spoiled the waters." When the Government in Portugal wanted the income of the monasteries and convents, the cry was raised that the monks interfered with political affairs, and so the revenues were all sequestrated, and most unfortunately the buildings and gardens, having no caretakers, are left to ruin and decay. In some of the larger towns they have been turned into hospitals; but in the country places desolation reigns supreme, where in times gone by, to say the least, a humanizing influence was exerted, and a centre was provided for the poor when sick or sorrowful; for these monks, with all the dark things

said of them, had still a bright side to their daily life. But instead of entering into a general view of the country, I would rather ask your attention for a short time to one particular district almost unknown to English naturalists, and where, last April, I spent several most interesting and enjoyable days.

The Gerez is a district situated about twenty miles from Braga, where the rail terminates, consisting of a series of rocky well-wooded slopes, rising to a height of nearly five thousand feet, and stretching for many miles to the Spanish frontier. At the foot of the valley are the Caldas de Gerez or Hot Springs. These have been known and valued from the most ancient times. As in many other such springs we find two sources within a few inches; one too hot to be borne by the human body, the other very cold. The water appears to be of the purest description, without smell or taste; but the effects are marvellous in Rheumatic and Liver Complaints. Were these Baths well known, and easy of access, those of Carlsbad and Vichy would soon be forgotten. As it is, though but little known in England, yet they are yearly visited by invalids from the towns of South America. During my stay, I found migrants from Bahia, Monte Video, Rio Janeiro, and many other distant places. These come to drink the waters, and for a time, at least, remove that most trying of ailments, affection of the liver. One of the Hot Baths is taken daily, fivepence being charged for a fresh bath, and the price decreasing, till after several bathers one penny only is the fee; and a very small tumbler of the warm water is drunk twice a day.

The Baths are evidently Roman, and of the most primitive construction, cut out of the rock which is very loose granite, so that the action of frost and weather causes very rapid disintegration, so much so, that the soil of the whole district is mainly composed of this, with an admixture of decayed vegetable matter, forming a kind of dry porous peat which is admirably adapted to the growth of a great variety of rare and interesting plants.

Amongst these were six species of Oak, including the *Quercus suber* or Cork Oak, the use of which is too well-known to need description. Amongst this forest growth I noticed, constantly occurring, huge rounded boulders of granite in places intermixed with felspar, and as I was informed occasionally the loadstone.

These rounded masses of granite remind one very much of the glacier-worked boulders in Switzerland, but I believe it is generally considered that in Portugal these rounded boulders are due to disintegration and not to glacier action. Nowhere have I seen granite so readily pulverized, so much so that when used in road making, it is soon trodden down, forming in dry weather a white, irritating, never-to-be-forgotten dust; but after rain, a white, greasy, unctuous slime. Next in importance to the Oaks, we find the Olive, but the wild tree stands in about the same position as our wild Crab does to the Pippin. When the fruit is fully ripe it becomes of a deep purple colour, and remarkable for the large amount of fixed oil which it contains, amounting to about seventy per cent. The Olives, which are gathered from the trees or fall to the ground in November, are crushed in a rough millstone into a pulpy mass: this is placed in canvas bags and subjected to a gentle pressure in a screw press. The oil thus obtained is run into tubs or cisterns containing water, this after the impurities have subsided is ladled into jars as Virgin Oil. After the oil has ceased to flow, the contents of the bags are mixed with boiling water, and a second quality of oil is obtained. A still inferior description is obtained by allowing the *marc* to ferment in heaps, when an oil called by the French *Huile Fermentée* is obtained. The Olive Oils of the Peninsula are, however, not considered of so fine a description as those of Italy and the South of France. Although the Olive is considered indigenous to Europe, I believe there is no doubt that its natural home is Palestine and Asia Minor extending into Greece. The unripe fruits preserved in brine constitute the Olives of commerce, but in Portugal they are generally found pickled in a ripe condition. Respecting the Grape, I can say but little. In some districts the vines are entirely supported on trees; the Oak, Willow, Apple, and others being made into Pollards for the purpose, and the fruit allowed to ripen as it will, without care or attention, only occasional pruning being resorted to; in others among the best districts the vines are all grown on the rod system from a single eye, and fastened to stakes as in the Rhenish provinces. The natural wine is found in three colours,—light yellow, like Sauterne; dull purple, like tawny port; and rich purple.

In the Gerez I found the true Portugal Laurel wild, also splendid arboreal Heaths twelve to fourteen feet high and almost as wide, covered with a mass of white or purple blossoms. The Spanish Broom with white flowers was most luxuriant, and in the underwood many rare bulbs, as Erythroniums or Dog's-tooth Violets, Crocus, Fritillarias, Tulips, several rare Orchids, especially of the genus Serapias, *Scilla unifolia* and *Scilla odorata*, but above all beautiful and rare Narcissi *N. bulbocodium* or Hoop Petticoat, and *N. nivalis* which Mr. Baker at Kew identified for me; this latter I found in great profusion, commencing about three thousand feet altitude, and extending to the top of Borraqerro, nearly five thousand feet. Below this, from fifteen hundred to three thousand feet, I found *Narcissus triandrus*, the most lovely of the genus, in five or six varieties. Herrick says, "Fair Daffodils," but those were only *N. pseudo narcissus*; at that time probably the only kind known to English horticulturists, it being reserved to the days of Parkinson to encourage the popular favour for this flower. Herrick's lines are too well-known to need repetition. Had he seen these growing in the Gerez, he would have said much more. Although *N. nivalis* and *N. bulbocodium* are now classified by name as different species, I cannot but consider them as varieties differing only in size and length of perianth and shape of cup, but all having the delicate primrose white, excepting in three instances, which were of a deep orange yellow; something more may be heard of these another spring, at any rate, "the adventurous botanist eradicated the lot." They may be a cross between the *nivalis* and *triandrus*, but that I must leave to be determined at the next Narcissus Conference Committee. I hoped to have found *Narcissus moschatus*, which has been lost for more than two hundred years, since the days of Parkinson, but this I have since received from a kind friend from the Spanish frontier.

Ferns were very plentiful, the true Maiden-hair (*Adiantum capillus veneris*), and many others; but more especially immense fronds of the *Trichomanes radicans*. These were hanging from the rocks, measuring from eight to ten feet in length, and being deciduous, I think would prove perfectly hardy out of doors in this country, especially if slightly protected with a few leaves.

The Prickly Opuntia and Aloe formed strong, though unsightly, hedges intermixed with Gum Cistus in full blossom.

To the Sportsman this district would prove most enticing. Wild Boars are still tolerably abundant, and the Wolf very frequent. The Sheep Dogs are very powerful animals, and are protected with strong collars environed by spikes.

A Contrabandista told us that he had shortly before come across the frontier from Spain, and had seen a Bull with his back against the rock confronted by a Wolf: he drove it off with a pistol shot; but upon returning a few days after, he came across the mangled remains of the Bull, which had fallen a prey to his crafty and insidious foe. These animals never attack men except driven by direst necessity. A plentiful supply is ever to their hand in the numerous wild animals found in the mountains.

Towards the top of the mountain we came on a fine specimen of the Golden Eagle, which had just struck down a Red-legged Partridge. This species of Eagle is common, as also a Spotted Eagle: and a third kind, which my informant could not name. The Kite is frequently seen, as also several other of the Hawk tribe, which have free quarters, plenty of provender, and breeding-place far away from molestation.

The Gerez is one of the last habitats for the Rock Goat (*Capra ægoceros*) in Europe as a wild animal; it appears to be the stock of all our domesticated varieties of Goats. It is readily noted by the horns being edged in front, and very long in the males, and short, or occasionally wanting, in the females. I think I am right in saying that few animals are so hardy as the Wild Goat, certainly few are so powerful and active. It is capable of maintaining its foothold on the smallest point on which its feet can rest, and of taking very considerable leaps with the utmost certainty of alighting safely; although the spot which it desires to attain is perhaps but the ragged point or slippery ledge of a precipice. It will thus find its food in places inaccessible to any other animals, and live and thrive by cropping the scanty herbage which they furnish. In the mountain ranges of Europe, on the Alps and Pyrenees, the Goat is found at an elevation approaching the line of perpetual snow. It is to be noticed that the Goat feeds on a greater variety of plants than any other ruminant, many which are distasteful, if not injurious, to others, are eaten with impunity; as the Hemlock, Henbane, and Digitalis, and even the very acrid Euphorbium, are not rejected.

The Oriental Bezoar Stone, at one time esteemed of great value, is a concretion found in the intestines of this animal; it is mainly composed of phosphate of lime, with a small amount of animal matter. These concretions were formerly supposed to possess extraordinary antidotal power and medicinal virtues; so much did this belief extend, that in process of time, other substances, regarded as antidotes, were called Bezoardical, and this word came to be synonymous with antidotal. Certain Bezoars were once valued at even ten times their weight in gold; they were not only taken internally, but also worn as amulets; they have, however, long since fallen into disuse in this country. These Bezoars vary in size from that of a bean to as large as a hen's egg. Like most valuable productions, the old writers say they were basely imitated; the artificial being composed of pipe clay, a little ox gall, with a judicious admixture of hair and wool, and these gave a yellow tint when rubbed with chalk, and a green one with lime, which tests were used for the genuine Bezoars.

The Red Deer is still believed to linger in the Estrella range, and the Fallow Deer, probably as a re-introduced species, is fairly abundant, and as all game laws are ignored, the sportsman has free licence to kill; but, I believe, the people are very careful as to the rights of property, and trespassers would be warned off. I did not hear of any close season; but a sort of tacit agreement seems to exist with sportsmen as to the time of shooting.

In the lowlands Quails and Snipe are very abundant, the former especially so, and affords excellent sport. Partridges are also plentiful.

I heard that Wild Boars were occasionally seen. I can readily imagine this to be true, for those in the farm-yards were long, lean, razor-back brutes, and a very few weeks' running would transfer them into the feral nature of Wild Pigs. But in this they have some idea of improvement, for the Allamantaj porkers are remarkable for their rotund figures.

It is said that the Civet (*Viverra civetta*) has become acclimatized in some districts. If correct, this is an extremely interesting fact, for we have here an animal a native of Africa, brought into captivity for a special purpose, and now run wild; due to some escapes at probably a distant period; and as but little is known

about this creature, I have ventured somewhat to trespass on your time respecting it. Baron Cuvier says: "The most remarkable peculiarity in the anatomy of the Civet is the organization of the bag containing its peculiar scent. It opens externally by a narrow cleft, and is exactly similar in both sexes. This cleft conducts into cavities, which might each of them contain an almond. Their internal surface is slightly covered with fine hair, and pierced with many holes, each of which conducts into an oval follicle of very slight depth, the concave surface of which is again pierced with innumerable pores. The odoriferous substance comes from these pores. In a state of captivity these follicles are very gently scraped, about every second day, to obtain the civet; but in winter it is secreted much more slowly. These follicles are enveloped by a membranous sac, which has the power of compressing the follicles. By this compression the animal gets rid of the superfluous part of its perfume. This odoriferous substance produced by the Civet, and to which the animal owes its common name, forms, especially in the East, an object of considerable commerce."

Its virtues, says the Baron, are greatly vaunted, and it was once the fashion among those who piqued themselves on their elegance to use it as a perfume, as it has since been the fashion to use musk and ambergris for the same purpose. It still enters into the composition of some medicaments and perfumes, but its use is greatly diminished. It used to be brought from the Indies and Africa.

Shakespeare especially, amongst our old writers, makes mention of this perfume. Thus in 'Much ado about Nothing:'

"He rubs himself with civet. Can you smell him out by that?"

In 'As you like it:'

"The courtier's hands are perfumed with civet."

And again:

"Civet is of a baser birth than tar; the very uncleanly flux of a cat."

And in 'King Lear:'

"Pah; pah! Give me an ounce of civet; good apothecary, sweeten my imagination: there's money for thee."

In the East the Civet is still brought up in a state of domestication for the purpose of gathering its perfume. An old

writer says, at Enfras, a town in Abyssinia, he saw upwards of three hundred of the animals with some merchants. The Civet sleeps continually, and is roused with considerable difficulty, and they are animals of the greatest indolence. This lethargic state does not permit us to discover anything like intelligence in the Civet; it is probable that they may be more lively in their wild state, but in captivity they do little but eat and sleep. When irritated the peculiar musky odour which they spread becomes stronger, and from time to time the secretion falls in small pieces from the pouch, which is about the size of a nut. It is about two and a half feet in length, and the tail is more than one foot: the height of the animal is about fifteen inches.

The Government of Portugal are making very interesting experiments in the acclimatization of forest trees; they have a very fine collection in the old monastery grounds at Busaco, where Conifers and many others are to be seen in a state of luxuriance, of which we in this colder climate of England can form but little idea.

I was particularly pleased with the Botanical Gardens at Coimbra, the university town of Portugal; where with small means at his disposal the curator, M. Henriquez, has done much to produce a display of semi-tropical plants and shrubs, many of them the finest I have ever seen. In Portugal nature has done much, consequently man seems to do but little, and as it has been said elsewhere, "they tickle the earth with a hoe and it laughs."

IV.

ON A FEMALE REDSTART (*RUTICILLA PHŒNICURUS*) ASSUMING THE PLUMAGE OF THE MALE, WITH REMARKS ON SIMILAR INSTANCES IN OTHER SPECIES.

By J. H. Gurney, Jun., F.L.S.

Read 26th January, 1886.

The Redstart which I have the pleasure of exhibiting this evening on behalf of Mr. J. G. Millais, was caught on its eggs by that gentleman in June, 1882, at Frostenden, in Suffolk, and is an undoubted instance of a female assuming the plumage of the male, though its sex was not actually proved by dissection. The male, in the ordinary plumage of a cock, was observed and shot at a short distance from his partner.

As will be seen, it bears no resemblance to the series on the table. The throat has not the mottling of a young male, nor has it the pure black of an old male. It exhibits a grey hue, which can be best expressed by saying that it is a little darker than the back of an ordinary adult male. The white forehead of the cock is but slightly shown, and the breast, though much redder than in an ordinary female, has not half the depth of colour of an adult male.

Instances of this assumption of male plumage by Redstarts are alluded to in Yarrell's 'British Birds' (first edition, vol. i. p. 240), where the author says: "Very old females obtain plumage somewhat similar to that of the males; but the colours are neither so bright nor so pure." Mr. Yarrell does not mention the number of specimens which were known to him; and the statement that they were "very old" though probable, is entirely conjectural.

* I regret that I am unable to give a coloured illustration, as it is difficult to convey a correct idea in a written description, but I hope that Mr. Millais' graphic brush will portray the exact colours of the bird on some future occasion.

In an interesting letter in 'The Field' (June 17th, 1871), writing under the signature of "Z," the late Mr. E. Blyth says that, in the springs of 1869 and 1870 he obtained fertile female Redstarts in male plumage, being attracted by their small size; adding that the colours were overlaid by dingy tips to the feathers, as in newly moulted males in autumn.

This description would apply pretty well to the bird upon the table, the colours in which are certainly dingy; but which, at the same time, is not like any autumn-killed male. In autumn there is generally a freshness and brilliancy about the plumage of either sex, which is wanting in Mr. Millais' female bird. As long ago as 1851, Mr. Blyth had written something on the subject in an editorial foot-note to an edition of Cuvier's 'Animal Kingdom' (p. 159), where he says that he had seen females of the Redstart, Linnet, Redpole, Red-backed Shrike, and Scaup Duck, which could not be distinguished externally from males, and all of them contained eggs in the ovarium. Doubtless the Redstart here mentioned was one of those alluded to by Mr. Yarrell (*l.c.*).

The examples mentioned by Yarrell and Blyth are all I know of, with the exception of one shown me some years ago by Mr. J. Gatcombe at Plymouth, which had been obtained near that place, and the bird upon the table belonging to Mr. Millais.*

Assumption of male plumage by female Red-backed Shrikes (*Lanius collurio*) has been recorded a few times, and in the opinion of the recorders, they were—like the Redstarts—not sterile. Why this phenomenon should occur in female Redstarts and Shrikes, and not in other Passerine birds (with the exception of the genus *Oriolus*, to be presently alluded to), is hard to explain. It is well known the domestic Duck occasionally assumes the plumage of the Drake. Such an one is figured in Rowley's 'Ornithological Miscellany' (vol. i. p. 118): two more are mentioned in Hancock's 'Birds of Northumberland and Durham' (p. 152), and the 'Transactions of the Tyneside Club' (vol. iv. p. 58); and another, believed to have been twenty-nine years old when it died, is recorded by my father in the 'Zoologist' for 1883 (p. 128). That what happens in tame Ducks should occasionally

* Professor Newton informs me that some German ornithologists, including Naumann (Vög. Deutschl. vol. iii. p. 514), mention it. It certainly never appears to have been figured.

happen in wild kinds is no more than is to be expected. My father once saw a female Red-breasted Merganser, which was proved to be a female by dissection, assuming male plumage, a record of which is given in the 'Zoologist' for 1854 (p. 4252). In this bird there was no sign of disease or exhaustion of the ovarium. But the domestic Ducks in drake attire were barren, and the same is the case, I suppose, with the Pheasant (*vide* Montagu's 'Ornithological Dictionary'), Capercaillie, and Black Grouse (*vide* Yarrell's 'British Birds,' vol. iii. p. 103); though whether the matter can be considered as altogether proved is doubtful. In the Pheasant it is not the old females only which get the plumage of males, but sometimes young ones; an instance of which has occurred at Northrepps.* There used to be an old Pea-hen, near Thetford, which had in part assumed the Peacock's plumage. Two similar instances are mentioned by Latham, who says that one of them ceased to lay eggs when it assumed the male plumage; but does not say if the other did ('Synopsis of Birds,' vol. ii. p. 672, plate 60). J. Butter mentions another. A domestic fowl, if it assumes male plumage, is considered worthless.† The rule appears to be, that Gallinaceous females become barren when they assume male plumage, but Passerine birds do not.

* J. Galley, the gamekeeper at Northrepps, has more than once had a young hen Pheasant, not old enough to leave its foster-mother's coop, begin to assume male plumage.

† A Black Bantam in complete male plumage is figured in Sterland's 'Birds of Sherwood Forest' (p. 183). It is as complete an example of the metamorphosis which takes place as could well be, the transformation including spurs, comb, and wattle. Another equally good is figured in the 'Memoirs of the Wernerian Society' (vol. iii. p. 188), in an article by J. Butter,—for a sight of which I am indebted to Professor Newton. A hen Pheasant shot at Keswick, near Norwich, November 16th, 1868—skinned and dissected by Mr. Shopland, taxidermist, Torquay—had assumed complete male dress in everything except spurs; the bare space round the eye was full size, and I have seldom seen a genuine cock with a longer tail; but such instances as these are *far* less common than a partial change. This Pheasant, if it had not chanced to be dissected, would have passed unnoticed, as many another bird probably does. Indeed such a perfect transformation is almost unique, according to Mr. Yarrell's valuable paper on the plumage of hen Pheasants (read before the Royal Society, May 10th, 1827). But hen Pheasants have sometimes assumed spurs, which this bird had not.

The genus *Oriolus* has been mentioned; but there is not much to be said about it, for it does not appear to be a case in point, the females, if they live long enough, generally, or perhaps always, becoming as bright as males (*vide* 'Ibis,' 1864, p. 412, *fide* E. Blyth; *l.c.*, p. 63, *fide* C. A. Wright; Yarrell, 'British Birds,' vol. i. p. 218, *fide* Hoy). It should, however, not be passed over, as bearing on the general subject.

Mr. Blyth suspected the same of the Indian Pheasants *Pucrasia* also ('Field,' June 17th, 1871, p. 489). My father sees some reason for thinking that the same is the case with the Merlin, of which a female in complete male plumage, killed in Cashmere, is described by Mr. J. Scully ('Ibis,' 1881, p. 418); and another, very far advanced, is figured in Dresser's 'Birds of Europe' (vol. vi. p. 83).

I have a female Merlin nearly as grey as Dresser's figure, killed in March, 1867, which was carefully sexed.

Supposed female Sparrow Hawks in male plumage have been recorded two or three times (*vide* Harting's 'Birds of Middlesex,' p. 8; 'Zoologist,' 1847, p. 1637; 1848, p. 2410).

Mr. Macpherson tells me that Mr. J. G. Goodchild has met with two female Kestrels assuming male plumage. Female Kestrels not uncommonly get on the lower part of the back a strong bluish tinge; one such was killed at Northrepps, and I have another which I shot in Algeria. Mr. R. B. Sharpe has given a figure in the 'Proceedings of the Zoological Society' (1874, p. 580), to which my father has drawn my attention, of a female trapped in Hertfordshire with the blue colour very strong.

V.

ORNITHOLOGICAL NOTES AT CLEY, SEPTEMBER 5TH TO 26TH, 1885.

By G. E. and F. D. Power.

Read 26th January, 1886.

September 5th. A Dunlin in worn breeding plumage shot. Several Nightjars about at dusk; three seen at once.

September 7th. Wind E. early, afterwards S. In the "Scrub" at and near sand-hills, immense numbers of Willow Wrens (sixty or more), several Whinchats, five Redstarts, Great Whitethroats, Wheatears, and Black-headed Bunting.

The Warblers—although not observed actually arriving—in the opinion of both Mr. Ashworth and my brother, greatly increased in numbers as the day advanced.

Nineteen Geese seen in flock. Several Little Stints.

September 8th. Wind N.W., fresh. Increase in number of Pied Wagtails; and Swallows passing west in early morning. In the "Scrub" Warblers very few. Lesser Whitethroat and Redstart shot, and Pied Flycatcher seen.

September 9th. Wind N.W., half-gale. Large migration of Swallows early, and also through the day. First Grey Wagtail seen. At the "Scrub" nothing but Meadow Pipits.

September 10th. Wind N.W., strong. A good many Common Sandpipers noticed, and seven Little Stints together. Nothing at the "Scrub."

September 11th. Wind N.E., very stiff, with rain. N.W. wind in afternoon. First Scoter, first Gannet, and two Skuas seen. A good many Terns observed. In the bushes only Willow Wren and Greater Whitethroat.

September 12th. Half-gale W.S.W. and rain. Many Godwits, one looking very red, and several Skuas observed. Common Terns, twenty or more, and the last three Lesser. A few Waders working west along beach; shot Reeve, and several others seen. A Tree Pipit found at the sand-hills.

September 13th. Half-gale S.W. Many Peewits appeared.

September 14th. Wind light S.; much rain and S.W. wind after. Reed Wren shot in reedy ditch. Several Stonechats, Greater Whitethroat seen. A Pied Wagtail with brown feathers on head shot.

September 15th. Wind S.W., stiff. Fine Red-throated Diver, with full red throat, obtained. Swallows travelling W.S.W. all the morning. A good many Martins, several Sand Martins, and two Swifts seen. From Morston Creek we shot two Godwit flying together—one proving Black-tailed and the other Bar. I should judge the Black-tailed to be an old bird fast losing its summer dress. Several Whimbrel seen.

September 16th. Wind S.W., stiff. Great numbers of Pied Wagtail, and many Meadow Pipits, Larks, and Linnets all arrived since yesterday. A Grey Wagtail seen. At the sand-hills many Meadow Pipits and a few Wheatears, and Black-headed Buntings. Two Swifts seen. Reed Wren heard singing.

September 17th. Wind S. early, veering to E. and back to S.W. during day (much fine rain). Swallows, Martins, and a few Sand Martins travelling S.S.E., and two Swifts (the last) seen. For the second and last time a good many Warblers in the "Scrub"—as before, principally Willow Wrens, Wheatears in some numbers, and two or three each of Redstarts, Great and Lesser Whitethroats. Last Nightjar seen.

September 18th. Wind E., light. Very fine. Several Hedge Sparrows noticed along the roadside (where they are usually scarce). More Golden Plovers than any day yet. In the "Scrub," six or seven Wheatears and as many Whinchats, four Great Whitethroats, two Willow Wrens, and one Tree Pipit. Green Sandpiper seen. Yellow Wagtails observed in parties for last time.

September 19th. Wind S.W. and driving rain; fresher wind and fine afternoon. A few flocks of Dunlin passed west. Some fresh and tame Godwits in the harbour. At the sand-hills, one Redstart, one Great Whitethroat, and one Common Wren only. Herring Gull, in nearly perfect summer plumage, shot.

September 20th. Wind S.W. to W.N.W. A good many Hirundines passing.

September 21st. Wind W.N.W. Swallows and Martins and five Sand Martins hawking under shelter of sea wall. First (two) Rock Pipits seen. At the sand-hills, six Wheatears, one Wren, a few Stonechats and Meadow Pipits only. Several Gannets observed.

September 22nd. Wind W.S.W. and stiff all day. More Godwits arrived, and a party of Grey Plover. Peregrine seen. Many large Gulls working west over the sea, and three yellowish-looking ones remarked. A splendid great Black-backed, in nearly perfect summer plumage, shot. A large flock of Knot in the harbour. Yellow Wagtails and Wheatears, three or four of each. The Eider seen again.

September 23rd. Wind W.N.W., fair, wet at night. Apparent arrival of Hawks. Peregrine, Merlin, Sparrow Hawk, and Kestrel all observed. A party of Martins travelling S.S.E., very high up. Several fresh parties of tame Godwits. Several Rock Pipits and three or four Wheatears at the sand-hills. Last Whimbrel observed. Shearwater seen. Last two or three Sand Martins seen.

September 24th. Wind W.N.W. to N.W., and freshening. Very few Swallows and Martins seen (except the resident birds, which are still numerous). Two nests of young Martins are still being fed in the main street of Cley.

September 25th. Wind N.W., thunderstorm and heavy hail showers. Some Skuas seen. Fresh Godwits and Grey Plovers observed. Also some tame Sanderlings on the beach. One Common Tern seen. One Yellow Wagtail and one Reed Wren observed.

September 26th. Gale from N.N.W. A good many Wild Duck and several Wigeon and Teal seen. Many Larks coming in from N.N.E. One Common Tern and one Common Sandpiper seen. Swallows travelling S.W. in considerable numbers. First Snow Bunting heard.

The chief points in this very blank expedition are, (1) the occurrence of Black-tailed Godwit, September 15th; and (2) the abundance of Godwits generally, as we have never met with them in anything like such numbers before.

Waders generally were, I should say, scarcer than usual, with perhaps the exception of Little Stints, which this year were decidedly numerous.

The appearance of the Warbler class in the "Scrub and cover" at and near the sand-hills, was puzzling in the extreme. There were only two "rushes," viz., on 7th and 17th, and these consisted chiefly of Willow Wrens, which we have not met with in any numbers on previous occasions. Tree Pipits, usually plentiful, were this year represented by two specimens. Wheatears were plentiful; but Whinchats and Redstarts never more than half-a-dozen or so on any one day. Bluethroat was never even seen; and Pied Flycatcher, so comparatively common last year, was only observed once. Garden Warbler, so plentiful last year, also failed to turn up this season.

VI.

ON THE FLORA OF THE CROMER FOREST-BED.

By Clement Reid, F.G.S.

Read 26th January, 1886.

The importance of our Newer Pliocene flora is seldom realized, for the plants found mostly belong to species still living in Norfolk. Few strange new forms have yet been discovered, and even the number of species now locally extinct is comparatively small.

But though the flora is so closely allied to the living flora of Norfolk, yet its study and careful examination is of great interest. For not only does it show the persistence of a flora consisting entirely, or almost entirely, of recent plants through a period when the large mammals, and even many of the mollusca, belonged to species now extinct; but it also shows the gradual change of the geographical distribution of plants as they are traced back through

successive epochs. It is therefore evident that the collection and examination of these plants ought to throw much light on the origin of the living flora of Britain, though the origin of that flora must be carried still further back into the Pliocene Period.

These are the points of special botanical interest brought out by this study. But there are also difficult geological problems which an examination of the plants ought to assist in solving. We know that an epoch of intense cold—the Glacial Epoch—intervened between the Pliocene Period and the Period in which we are now living. This is generally recognised, though the extent to which the Arctic conditions affected the fauna and flora, and the southern limit of the intense cold, are still disputed points.

A study of the fauna has shown that there was a sweeping extermination of the large highly specialized mammals; but that the more lowly organized orders, and the invertebrate animals, mostly survived.* The examination of the plants brings out this partial and local character of the change even more markedly, and it seems evident that the species driven out of the country by the cold of the Glacial Epoch, must have survived within a moderate distance of England. If the intense cold had extended, as is sometimes suggested, far south of Britain, we should scarcely expect to find that most of the plants of the Pre-Glacial Cromer Forest-bed have been able to re-take their old province—we should rather expect to find numerous extinct forms among the fossils, and that those driven southward into Africa, or to the shores of the Mediterranean, had been replaced by a very different assemblage.

In the endeavour to throw a little light on these questions, I have continued the collection and study of the plants since the official survey was finished in 1879. The results may perhaps seem scarcely to repay the time and trouble needed for long journeys to Norfolk to obtain material, and for the devotion of evening after evening to the washing, picking out, and mounting of the seeds. Unfortunately there is seldom anything preserved but fruits and seeds—though these are much more satisfactory for determination than leaves. During December, 1884, a consider-

* See also Reid, 'Memoirs of the Geological Survey.'—"Geology of Cromer," p. 60.

able amount of the fossiliferous clay was obtained. This has yielded a number of unrecorded species, and the gradual increase of my collection of recent seeds has enabled me to work out the flora more thoroughly than before. None of the new determinations have, however, been included in the list unless endorsed by Mr. Carruthers or Mr. Ridley, who have also recognised several forms of which I had no recent specimens for comparison. To them, and to the other officers of the Botanical Department at the British Museum, I must express my thanks for the great trouble they have taken in examining and verifying the determinations.

More clay was obtained last December; but this material as yet has only been partially examined. There are also several unrecognised species left from previous collections, which in time it may be possible to determine. Ultimately, a more exact knowledge of the British Pliocene flora will be obtained; but meanwhile the list given below more than doubles the number of species recorded from the Cromer Forest-bed. From other Pliocene beds in Britain no plant remains are yet known, except occasional pieces of drift wood in the Crag, and a nodule of clay with an undetermined leaf, from the Chillesford Clay at Easton Bavent.*

The only mode by which plants can be obtained from most parts of the Cromer Forest-bed is by thoroughly drying masses of the clay, and then letting them fall to pieces in a sieve in water. By this means abundance of seeds can be washed out of beds which at first sight appear almost unfossiliferous. The estuarine clays, however, are seldom worth searching, for though full of drift wood and twigs, and occasional fir-cones, small seeds and fruits are rare and much damaged. Thus, the majority of my specimens have been obtained from the thin "Upper Fresh-water Bed," and a considerable number from the still more impersistent "Lower Fresh-water Bed," while the thicker intervening mass of estuarine clay and lignite has yielded comparatively few forms—in fact little but forest trees.

As a guide for those wishing to study the botany of the Cromer Forest-bed, a short note is given below of the botanical and lithological character of the beds at each locality which has been

* Prestwich, "Structure of the Crag-beds," part ii. (Quart. Journ. Geol. Soc. vol. xxvii. p. 345).

specially examined for plants. But it must be pointed out that there are many equally promising beds which want of time, or persistent talus, has prevented my searching.*

Beeston.—Between Beeston Hill and the small stream east of it, immediately above the beach, there is a bed of black peaty clay, extending for about half a mile. Some part of this bed can nearly always be examined; but apparently the most fossiliferous portions are those full of the twiggy stems of a small shrub, perhaps a Heath or *Vaccinium*. No remains of forest trees have been noticed here, and of about thirty plants, all, except a doubtful Thistle, are aquatic or marsh species. The seeds are generally well preserved, and little compressed; but no leaves were noticed. This locality yields numerous specimens of a curious undetermined bolster-shaped fruit nine millimeters in length.

Runton.—On the west side of West Runton (or Woman Hithe) Gap occurs the wonderfully fossiliferous deposit which has yielded so large a number of fresh-water shells and small bones. Plants are comparatively rare, and badly preserved; but the clayey portions have not yet been properly searched, the bed having been much obscured by talus and the high beach for several years. The few species noticed include the Sloe and Alder, as well as several aquatic plants. The upper peaty portion of the bed would probably also repay examination, if the less decayed layers were selected. The only part of this deposit which has been systematically washed and examined is sandy, and sands seldom yield many remains of plants.

Cromer.—About three-quarters of a mile north-west of Cromer, rarely exposed at low water, is two or three feet of tenacious black mud, very difficult to wash. This mud rests on the Weybourn Crag and Chalk, and is overlaid by estuarine clays with lignite and fir-cones. It represents the Lower Fresh-water Bed. The small quantity examined contained abundance of sporangia of two species of *Chara*, besides other aquatic plants.

Sidestrand.—Opposite Sidestrand Church, the fresh-water clays at the foot of the cliff are full of beautifully preserved seeds and fruits belonging to about forty species. Portions of skeleton leaves

* Fuller descriptions of the Forest-bed will be found in the 'Memoirs of the Geological Survey.'—"Geology of the Country around Cromer," pp. 20-80.

also occur, and certain parts of the bed contain Moss so perfect, that it can be washed out and dried in ordinary botanical paper. The determined plants are all aquatic. Specimens from this locality are better preserved than from any other yet examined. Minute winged seeds of undetermined species are not uncommon.

Trimingham.—Carbonaceous stony silt, belonging to the Lower Freshwater Bed, can occasionally be seen on the foreshore; but the locality is difficult to find, no landmarks being visible, except the posts of an old groyne which lies about three hundred and fifty yards to the south-east. Constant landslips make this part of the foreshore very obscure. The bed contains numerous fragments of Moss, and seeds of aquatic plants; *Potamogeton crispus* being especially abundant, and often having the clusters of fruit in their natural position, though the stems and leaves have entirely disappeared.

Mundesley.—South of the old sea-wall, and a foot or two above the ordinary beach level, there are small eroded channels in the estuarine beds, filled up with blue stony clay, with abundance of seeds and *Unios*. Where thickest, this fresh-water deposit did not exceed eight inches, so to find it needs careful search; but it is sometimes conspicuously exposed on a platform of the clays from which the overlying sandy beds have been removed. The thirty or forty species of plants obtained contain a large proportion of marsh, as distinguished from truly aquatic forms, but no forest trees.

At a quarter of a mile south-east of the sea-wall, the estuarine beds contained several large cakes of peat full of the curious fruit of the Water Chestnut (*Trapa natans*); but these are probably now all washed away, as no specimens have been found for several years.

Bacton.—Opposite Ostend Gap (where there is a brick-kiln near the edge of the cliff) there is hard thick-bedded fresh-water loam and lignite at the foot of the beach. This contains many cones of the Scotch and Spruce Firs, fruit of *Trapa natans*, Yew, Alder, Hazel, Oak, and numerous aquatic plants. Different parts of the bed vary very much: the last I washed being almost unfossiliferous. This bed is apparently continued in a thinner bed of lignite, often cut out by the Boulder Clay, between Ostend and Happisburgh; but this part of the coast is nearly always hidden by beach and blown sand.

Happisburgh.—After exceptionally violent storms, numerous slabs of clay-ironstone are thrown up on Happisburgh beach; these are full of leaves of forest trees, and yield the only evidence of Beech and Elm, besides leaves of Oak, three species of Willow, and a few aquatic plants.

Pakefield.—Not many yards south of the Lighthouse Gap, an eroded hollow in the bedded clays is filled with laminated loam and peat. About five pounds weight of material, obtained last December from the lower part of the hollow, near its northern end, yielded about twenty-five species, mostly of marsh and aquatic plants, including two or three unknown elsewhere. This is evidently one of the best places for collecting plants, as the specimens, though compressed to an unusual extent, are otherwise well preserved. Leaves of Oak are apparently abundant; but, of course, no perfect specimens were obtained in washing the material. This is the only deposit in the cliffs near Lowestoft which I have yet had an opportunity of examining, Mr. Blake's valuable section of these cliffs having only recently been published.

Dicotyledons.

* *These species are new to the list.*

Thalictrum minus. Linn.

Numerous very acute achenes of *Thalictrum* were referred by Mr. Carruthers to this species (as *T. flexuosum*). Localities—Sidestrand, Mundesley.

* ——— flavum. Linn. Meadow Rue.

The small blunt achenes of this species are common at Sidestrand, Mundesley, Ostend, and Pakefield.

Ranunculus aquatilis. Linn. Water Crowfoot.

Achenes are abundant nearly everywhere in both the Upper and Lower Fresh-water Beds.

* ——— repens. Linn. Creeping Buttercup.

A few achenes have been found, but they are nowhere common. Beeston, Mundesley, Pakefield.

[NYMPHÆA ALBA. Linn. White Water-lily.]

The specimens of this species from Happisburgh, belonging to the King collection, are now in the Norwich Museum, but it is doubtful whether they do not come from a more recent deposit than the Cromer Forest-bed. No trace of the species has been found in the larger collections made within recent years, and one would expect seeds of a Water-lily to be abundant if they occurred at all.

NUPHAR LUTEA. Sm. Yellow Water-lily.

One of the commonest plants nearly everywhere.

* STELLARIA AQUATICA. Scop. Water Starwort.

Only three seeds of this species have yet been found. Beeston.

[STELLARIA ? sp.]

A single large seed was found, but accidentally destroyed before it could be determined. Between Trimingham and Mundesley.

* MEDICAGO ? sp. Medick.

Mr. Ridley suggests that two curiously marked pods (?) may belong to this genus, but they do not agree with any living English species. Mundesley.

PRUNUS SPINOSA. Linn. Sloe.

Rare. West Runton, Happisburgh, Pakefield.

* SANGUISORBA OFFICINALIS. Linn. Great Burnet.

A single well-preserved fruit has been found at Mundesley, and another at Sidestrand.

* RUBUS FRUTICOSUS. Linn. Blackberry.

A single perfect seed and a quarter of a second specimen is all that has yet been found. Pakefield. Mundesley.

[PYRUS, sp.] Apple ?

The specimen so named in the 'Geology of Cromer' probably belongs to *Nuphar lutea*.

MYRIOPHYLLUM, sp. Water Milfoil.

A few seeds have been found at Sidestrand and Trimingham.

Hippuris vulgaris. Linn. Mare's-tail.

Common. Beeston, Cromer, Sidestrand, Mundesley, Ostend.

Trapa natans. Linn. Water Chestnut.

Fruit are abundant in the Lower Fresh-water Bed at Mundesley, but very rare elsewhere. Mundesley, Pakefield, Ostend. This species is not now living in Britain.

* Œnanthe lachenalii. Gmel.

Only single specimens of detached carpels have been found at each locality. Mundesley, Pakefield.

* Peucedanum palustre. Moench. Hog's Fennel.

A single well-preserved detached carpel has been found at Pakefield.

* Cornus sanguinea. Linn. Cornel.

Five specimens of the characteristic two-celled stone of this species have been found at Happisburgh.

* Carduus ? 2 sp. Thistles.

A few scattered achenes, apparently belonging to two species of Thistles, have been found, but until more specimens have been obtained it will be unsafe to give them any specific name. Beeston, Mundesley.

Bidens tripartita. Linn. Bur Marigold.

A single achene has been found at Mundesley, and three at Kessingland.

Menyanthes trifoliata. Linn. Bog-bean.

Seeds are common in the Lower Fresh-water Bed, but rarer in the Upper. Cromer, Mundesley, Happisburgh.

* Lycopus europæus. Linn. Gipsy-wort.

Four or five nutlets have been found at Mundesley.

* Stachys palustris. Linn. Marsh Woundwort.

A few nutlets have been found at Beeston.

* Myosotis cæspitosa. Schultz. Forget-me-not.

Nutlets are occasionally found at Mundesley and Beeston.

* Suæda maritima. Dum. Seablite.

Seeds corresponding exactly with this species, except that they are slightly smaller than my recent specimens, occur at numerous localities.

* Atriplex, sp. Orache.

A few small seeds, like the smaller seeds of *Atriplex patula*, have been found at Sidestrand and Pakefield.

Rumex maritimus. Linn. Golden Dock.

Fruit common at most localities of the Upper Freshwater Bed.

* ——— acetosella. Linn. Sheep Sorrel.

A single well-preserved fruit of this species has been found at Beeston.

——— sp. Dock.

Badly preserved fruit of a third species of *Rumex* occur. One specimen, since accidentally destroyed, showed reticulated veins on the fruiting sepals, and probably belonged to *R. crispus*. Sidestrand, etc.

* Euphorbia amygdaloides. Linn. Wood Spurge.

Two seeds of this species have been found at Mundesley.

——— sp. Spurge.

Some curious spinose seeds (*l*) have been referred by Mr. Britten to this genus, but they do not appear to correspond with any living British form. They are not uncommon at Mundesley and Beeston.

Ceratophyllum demersum. Linn. Hornwort.

Fruit common at nearly all localities. They vary much in the length of the spurs, but only one specimen has been found entirely without them.

Ulmus, sp. Elm.

Leaves are found in clay-ironstone at Happisburgh.

Quercus robur. Linn. Oak.

Leaves and acorn cups are found at Ostend, Happisburgh, and Pakefield.

Fagus sylvatica. Linn. Beech.

At present this species is only known from the clay-ironstone of Happisburgh.

Corylus avellana. Linn. Hazel.

The Hazel, though so abundant in Post Glacial submerged forests, is very rare in the Cromer Forest-bed. I have only met with it at Ostend.

ALNUS GLUTINOSA. Linn. Alder.

Female catkins abundant at many localities.

BETULA ALBA. Linn. Birch.

Wherever leaves are preserved, the Birch is found. Birch twigs are also found in the estuarine beds.

SALIX, 3 sp. Willows.

Among the leaves in ironstone are three species of Willow found at Happisburgh. Willow wood is also common in the estuarine beds.

MONOCOTYLEDONS.

* SPARGANIUM RAMOSUM. Huds. Bur-reed.

No Bur-reeds have been found in any part of the Cromer Forest-bed, except the peaty deposit at Pakefield, where the many-ribbed seeds of the above species are abundant, and at Beeston, from whence a single specimen has recently been determined. *S. simplex* is characterised by smooth, and *S. neglectum* by few-ribbed seeds.

POTAMOGETON HETEROPHYLLUS. Schreb. Various-leaved Pondweed.

Drupes of this Pondweed are very abundant in lacustrine clays at all localities except Pakefield.

——— CRISPUS. Linn. Curly Pondweed.

Detached drupes are abundant at Beeston, Sidestrand, and Mundesley, while at Trimingham the fruit occur in clusters, though the stems have entirely disappeared.

——— TRICHOIDES. Cham. Slender Pondweed.

Though one of the rarest of our living British Pondweeds—being entirely confined to Norfolk—drupes of this species are very plentiful at Beeston, Sidestrand, Mundesley, and Pakefield.

——— PECTINATUS. Linn. Fennel Pondweed.

(= *P. flabellatus* of the Cromer Memoir.)

Drupes of this species, often $\frac{1}{6}$ inch, are common in most of the lacustrine clays.

[Potamogeton lucens. Linn. Shining Pondweed.]

This is the only species recorded by Mr. Bell from the Cromer Forest-bed. The specimens may belong to one of the above forms, but I have not seen them.

Zannichellia palustris. Linn. Horned Pondweed.

Carpels of more than one variety of this species are found in most of the fresh-water clays. At Pakefield a remarkably spinose form occurs.

* Alisma plantago. Linn. Water Plantain.

Detached carpels occur at Beeston, Sidestrand, and Mundesley.

Juncus, sp. Rush.

A few fruit of Rushes have been found, but none of the specimens are sufficiently well preserved for determination.

* Cladium mariscus. Br.

The hard fruit of this plant are occasionally found at Beeston and Mundesley.

* Scirpus pauciflorus. Lightf.

A common species at Beeston and Mundesley, also found at Pakefield.

* ——— caespitosus. Linn.

Common at Beeston and Mundesley.

* ——— fluitans. Linn.

Rarely found at Beeston.

* ——— setaceus? Linn.

A single minute fruit is doubtfully referred by Mr. Ridley to this species. Locality, Beeston.

* ——— lacustris. Linn.

A common species at Beeston and Mundesley.

* Carex riparia? Curtis.

A single fruit is doubtfully referred by Mr. Ridley to this species. Locality, Mundesley.

* ——— paludosa. Good.

A single fruit, apparently belonging to this species, has been found at Pakefield.

Phragmites communis. Trin. Reed.

Matted stems of the Reed are often found in the cakes of peat in the estuarine division of the Forest-bed.

Gymnosperms.

Pinus sylvestris. Linn. Scotch Fir.

Common at various localities, especially at Happisburgh.

[——— montana.] Mountain Pine.

Determined by Professor Heer,* and figured by Professor Saporta† from the Cromer Forest-bed, but I can find no specimens in English collections referable to this species.

——— abies. Linn. Spruce Fir.

Cones of the Spruce Fir are common near Happisburgh and Mundesley.

[——— pectinata.]

Determined by Professor Saporta among specimens received from Mr. Gunn: he figures a single scale of the cone.† *Pinus pectinata* is generally considered to be a variety of *P. abies*.

Taxus baccata. Linn. Yew.

Abundant at Happisburgh, Bacton, and Pakefield; rare elsewhere.

Cryptogams.‡

Osmunda regalis. Linn. Royal Fern.

A few specimens of the woody stock of this Fern have been found in the estuarine division of the Forest-bed at different localities.

* Isoetes lacustris. Linn. Quillwort.

A single sporangium has been determined by Mr. Ridley. Locality, Beeston.

Equisetum, sp. Horsetail.

A few stems of *Equisetum* in peat, and an impression in ironstone have been found, but none of the specimens are specifically determinable.

* 'Primœval World of Switzerland,' vol. ii. p. 171.

† 'Le Monde des Plantes,' p. 349.

‡ The Mosses, and species of *Chara* are still undetermined.

VII.

A VISIT TO THE ISLES OF SCILLY DURING THE NESTING SEASON.

By Edward Bidwell.

Read 26th January, 1886.

In the spring of last year I accepted an invitation from my friend Mr. William Graham to accompany him on a trip to the Isles of Scilly, for the purpose of procuring eggs of some of the sea birds which breed there, and I have ventured to write the following short account of my visit, in the hope that it may be of interest to some of my fellow members of the Norfolk and Norwich Naturalists' Society.

To prevent delay in getting to our destination, Mr. Graham sent his yacht to Falmouth, and it was a gloriously bright morning when, on Friday, the 22nd May, 1885, we stepped on board the "Wenonah" yawl, flying the flag of the rear commodore of the Corinthian Yacht Club; but the waves in the harbour showed that there would not be much chance of getting round the Lizard until the strong south-west wind which was blowing had abated.

As it was impossible to make a start, we utilised our morning by exploring the town of Falmouth, and visited Mr. Gill the taxidermist, who showed us a Crested Lark which he had shot in the neighbourhood in 1865, and a male Red-footed Falcon in adult dress, which had been brought to him alive in first plumage in 1867, and which he had kept alive for nine or ten months. In the afternoon we sailed up the beautiful Truro river as far as the bar at Restrongnet, where the state of the tide compelled us to take to the gig. During our row we saw a small flock of Knots, which were just beginning to assume their summer plumage,—the grey giving place to a tinge of brown,—and these were the only waders we noticed. On arriving at Lord Falmouth's boat-house, we landed, and walked through Tregothnan Park to Lamorran to see the well-known gardens of the Hon. and Rev. J. Townsend Boscawen, who, knowing we were at Falmouth, had most kindly written, inviting us to walk over and see his Rhododendrons, which were then in all their glory.

Mr. Boscawen's name is so well known in connection with the cultivation of this plant, that any one who takes an interest in it can imagine how grand a sight these gardens presented. The care bestowed in the selection of species, their successful crossing, combined with the situation and the climate, have produced a result of which their owner may be justly proud.

On Saturday, the 23rd, the wind still remained in the same quarter; so a start for the Isles of Scilly being out of the question, we went by rail to Penzance, and called upon Mr. Vingoe, the well-known birdstuffer, who has opportunities beyond many of his calling for picking up rare stragglers to the British coast, and whose collection of birds abounds with interesting specimens.

On Sunday morning, though still blowing hard, the wind had shifted, and we made an early start for our destination. We had not long passed Pendennis Castle before we saw various rock birds such as Puffins and Guillemots, whilst Cormorants were constantly appearing. Gannets too, were, fairly numerous, in all cases their white plumage denoting that they were mature birds.

Though in passing the Lizard our course lay near the shore, and a sharp look-out was kept, we were unable to distinguish a single Chough, nor during our visit were we able to identify this rare Cornish bird.

After a rough but glorious sail, we anchored off Penzance at six o'clock on Sunday evening, planning to start again at daybreak, when we hoped that the wind might be in a more favourable quarter for making the Isles of Scilly. But

> "The best laid schemes o' mice an' men
> Gang aft a-gley."

During the night the wind shifted due south, and as it was impossible to get into Penzance Harbour, the only thing to be done was to run for the shelter of the Lizard, and at eight o'clock on Monday morning we anchored in the Helford river, just seven miles from where we had started twenty-four hours previously.

In this pretty river we were detained by the weather two days, during which time we amused ourselves by fishing and nesting; but were not very successful in either pursuit. Of the birds which we observed there, the most interesting to me was the Rock Pipit—a bird which, according to Professor Newton, does not breed between the Thames and the Humber. Unfortunately we were unable to

obtain its eggs, as all the nests we found contained young birds. We also saw a large flock of Black-headed Gulls (*Larus ridibundus*), of which bird it is stated by Mr. Rodd that it is not now known to breed in any part of Cornwall.

On Wednesday, the 27th, change of wind enabled us to make another start, of which chance we were not slow to avail ourselves; and after an early breakfast, we once more passed the Lizard, this time under storm-canvas, as it was blowing hard.

Beyond Cormorants, Gannets, Gulls, Guillemots, and Puffins, we did not see any birds until just as we passed the "Wolf" light-house at noon, when we saw about a dozen Swallows on migration. From their course we concluded they would make the Irish coast. In spite of the lateness of the season, we saw several more small parties of these birds during the afternoon.

We now saw a good many Shearwaters, generally three or four birds flying together, their wings seeming almost to touch the waves as they skimmed the surface of the stormy waters.

At length the more easterly of the Isles of Scilly became visible, and taking the southern channel and sailing round the western end of St. Mary's, we anchored off Hugh Town (the capital) about five o'clock in the afternoon.

At this point it may be as well for me to give a very brief description of the archipelago, which lies thirty-five miles to the south-west of Land's End. Only five of the islands are now inhabited; namely, St. Mary, Tresco, Bryer, Agnes, and St. Martin. Samson, which was formerly the residence of four or five families, is now used for pasture, as are three or four of the smaller islands: the remainder are only the habitation of the rabbit, the seal, and the sea bird.

The geological formation is a coarse granite, which, through rapid disintegration, is worn by the action of the weather into shapes the most fantastic. The coarseness of the granite has a great advantage for the collector, as he is able to climb and walk about much more easily than on trap or basaltic rocks; but, it must be admitted, at a fearful expense of boots and clothing.

The greatest height of any island is one hundred and eighty-four feet; but in this, as in many other particulars, they vary exceedingly, some being of quite low elevation.

The surfaces of many of the larger rocks are covered with

vegetable mould, in which the Pink Thrift (*Armeria maritima*) grows in profusion, as well as the Sea Campion (*Silene maritima*), the Scurvy Grass (*Cochlearia officinalis*), and the Brake (*Pteris aquilina*); while the abundance of yellow Rock Lichen (*Parmelia paretina*) adds a pleasing variety to the scene.

The introduction with which we were provided procured a most hospitable reception from T. A. Dorrien Smith, Esq., the Lord Proprietor, who, having a true naturalist's hatred of the wanton destruction of life, does everything in his power to protect the birds which frequent his islands, but who is also always willing to assist a brother ornithologist in the pursuit of his study.

At Mr. Smith's invitation we at once proceeded to Tresco Abbey, a spot known throughout the length and breadth of the land for its glorious garden—a garden which bears a magnificent testimony to the skill of him who planned it, and which shows abundant proof of the intense interest taken in it by its present possessor; a garden which it is totally beyond my powers to describe, but which the photographs on the table may in some measure enable you to realise.

The late Mr. Edward Hearle Rodd, of Penzance, who for nearly forty years was the historian of the Birds of Cornwall, obtained many of his rarest birds from Scilly, Mr. Dorrien Smith, with great generosity, having forwarded every scarce bird that was shot to add to his friend's unrivalled county collection.

Since Mr. Rodd's decease, in 1880, Mr. Smith has formed a collection of Scillonian birds, and during the five years that he has collected he has obtained many of exceeding interest, rare waders being a strong feature, the only English killed specimen of the Solitary Sandpiper (*Totanus solitarius*, Wilson), which was shot in 1882, being among the number.

Mr. Smith has also kept a record of all the species that have been identified; which list, he informed me, now includes two hundred and twelve species, the rarest of all being the Killdeer Plover (*Ægialites vocifera*, Linn.), the only authentic instance of this American bird having been met with in Europe.

In this list I also noticed such rarities as the Lesser Grey Shrike, Red-breasted Flycatcher, Rufous and Great Reed Warblers, Buonaparte's and Pectoral Sandpipers, Whiskered and Gull-billed Terns, in addition to many interesting birds, as the Black Redstart,

Short-toed Lark, Ortolan, Scops Owl, Woodchat, Little Ringed Plover, Brown Snipe, Buff-breasted Sandpiper, Surf Scoter, and White-winged Black Tern. I am sure you will agree with me, that it is indeed fortunate for the cause of British Ornithology that the proprietor of these isles takes so great an interest in their avi-fauna.

The Earl of Gainsborough and Mr. R. C. Gwatkin, who were staying at the Abbey, had visited some of the isles, and as they had not been to the Eastern Islands, Mr. Dorrien Smith proposed that we should sail there in his yacht the following afternoon.

Early on Thursday morning the "Wenonah" was moved from Hugh Town to New Grimsby Harbour, a sheltered channel lying between the islands of Tresco and Bryer. After breakfast we started, a party of six, in the yacht's gig, for the Island of Samson, which we searched thoroughly; but it did not prove a rich hunting-ground, except to Mr. Graham's son, who had the good fortune to find a nest of the Rock Pipit, containing four eggs of that bird and one of the Cuckow; a nest of the Oystercatcher with three eggs, and a nest of the Wren, built in a fissure of a rock, with six eggs, being our only other finds.

In the afternoon there was such a sea running, that it would have been impossible to land, we therefore postponed to the following day our visit to the Eastern Isles, and the time was devoted to seeing the Abbey Gardens, under the guidance of our host.

Friday brought more propitious weather, and we all embarked in the "Scillonian." As we sailed along, numbers of Terns were on the wing, the majority of them being the Common Tern: the only other species identified during our visit was the Sandwich Tern. Cormorants and Shags were in abundance, and the Lesser and Great Black-backed Gull were always in sight.

Menewithan was the first island we touched, and four of our party landed, to climb to its grass-covered summit, where we found several nests of the Great Black-backed Gull, all the eggs being very much incubated; and in one instance, two young Gulls in down were caught. On the sides of the hill, and among the rocks, were many nests of the Lesser Black-backed Gull; but in every instance at some little distance from the summit, which was claimed by the larger species, a bird which will admit of no encroachment on its domain.

Under a huge mass of granite were found two eggs of the Shag, which always selects a sheltered spot for its nest, thus differing from its near congener the Cormorant, a bird which chooses an exposed situation.

While we were on this island, the remainder of the party sailed to Inisvouls, where they found several nests of the Cormorant, with young birds ready to fly.

It had been arranged to lunch on Great Gannilly, so for that island we now steered, and on landing we separated into two parties, one of which turned to the south, whilst the other explored the northern half. Oystercatchers there were in great numbers, and a Wren was seen, but no nests were found.

A large Seal was swimming about within range, and although it offered a tempting shot it was not fired at, as the tide was ebbing, and it could not have been secured if killed.

Luncheon, to which, after our long ramble, we did ample justice, was spread on a plateau at the eastern side of the island. A more charming spot could not have been selected, nor a more glorious day on which to visit such a scene.

We had a rapid passage back to Tresco, where, bidding adieu to our host, we walked over to Grimsby and rejoined the "Wenonah."

On Saturday morning, after an early breakfast, we started in the gig for an excursion to the Western Islands, and rowing between Sampson and Bryer, shaped our course for Mincarlo, and after some little delay in landing, caused by the heavy swell, we commenced a stiff climb up the rock. Here we found numerous nests of the Lesser Black-backed Gull and the Herring Gull, while many eggs of the Razorbill were lying under the fallen blocks of granite. Higher up, in a sloping bank of mould, were a number of holes excavated by the Puffins, and with the aid of a spade, which our pilot had brought, we dug out a few of their eggs. On the summit of the rock was a large colony of Cormorants, whose nests were in most instances tenanted by young birds nearly ready to fly. Our appearance on the scene was the signal for a grand stampede, the young birds flapping along at the top of their speed, and endeavouring to get out of our reach in the crevices of the rocks. Three promising youngsters were caught and carried on board the "Wenonah," eventually to find a home in Mr. Graham's menagerie at Crayford, where two

of them are now in capital condition. After securing a few eggs we hurried from the spot, as the remains of the fish which had been disgorged by the parent birds for the benefit of their young, rendered it anything but a pleasant place. A little lower down the rock we saw nests of the Shag, some with fresh eggs, many with young; the naked condition of some indicated that they were but recently hatched, others had a covering of sooty down, evidently two or three weeks old, and again, some were nearly full feathered. As we were returning to the boat, we found a nest of the Oystercatcher with its full complement of three eggs.

We then steered for Illiswilgig, a small island with a conical hill, on the very summit of which was placed a nest of the Great Black-backed Gull, whilst on the lower ground were the nests of the two commoner species, and Shags' nests were seen under many of the granite boulders.

Scrambling over the rough sea-weed-covered stones, on our return to the boat, we found an enormous number of Limpets *(Patella athletica)*, many of which had attained a size unusually large even for this species.*

Keeping to the northward, we next rowed to the grandest and most picturesque rock in the archipelago—Menavore. It is divided into three pinnacles by wide chasms, whose sheer sides afford good places for the rock-birds. We were able to secure a landing on the most easterly portion of the rock, and after a stiff climb we reached a long plateau, from which we had a good view of the precipitous sides. In addition to some finely marked eggs of the Razorbill, we here obtained our first egg of the Guillemot. We did not see any other birds on this rock, although it presented to the human eye every attraction for the Kittiwake, a bird which was in constant attendance upon the yacht in Grimsby Harbour, but whose nesting-place we were not able to find.

When we had reached the higher ledges of the rock, our

* Mr. Edward Lovett of Croydon tells me that he has observed a variation in form according to situation both in this species and *P. vulgata*. When the Limpet has established itself on the side of a rock facing the sea, which is exposed to the full force of the waves beating upon it, the shell becomes pointed and of great strength and thickness at the apex; but when living in a channel where the water rushes by it, the shell is found flattened and spreading, the sides thus offering little resistance to the passing waves.

presence disturbing the birds, they flew down to the sea in a continuous rush. As they passed the boat the stream was so thick, that one of the crew knocked down a Razorbill with a boat-hook.

Round Island, whose summit, some one hundred and fifty feet above the sea, looked inaccessible from the boat, was our next field for search. After an exciting landing, owing to the swell, we managed to reach the top by a rugged path, and found the accumulation of earth there riddled with holes made by the Puffins. This island is considered their chief haunt, but as the Trinity House is now about to erect a lighthouse on the rock, many of the birds will have to find a fresh home.

The only other birds nesting there were the two usual species of Gull and the Razorbill; but we felt repaid for our climb by the splendid view of the isles which we obtained. On regaining the boat we rowed to the yacht, well satisfied with the result of our day's work. Our evening was fully occupied in blowing the eggs which we had taken, and it was late before we turned in.

On Monday morning we decided to visit Annet, which is of greater interest to the ornithologist than any other of these isles, on account of its being the nesting-place of a large colony of the Manx Shearwater, a bird which has been observed off the Norfolk coast a good many times, and in some few instances picked up inland in the county after severe gales. It has no known breeding station on the east coast of either Scotland or England. I have seen it in July off the coast of Durham, and it is of frequent occurrence at Flamborough. To see it in its nesting haunts one must visit the western coast of Great Britain, and the prospect of taking its egg and studying it at home was one of my greatest reasons for going to the Isles of Scilly.

Willoughby, who called this bird "The Puffin of the Isle of Man," from its having been found breeding in the Calf of Man, writes of it in the following words taken from the English edition of 'The Ornithology,' translated by John Ray and published in 1678.

"At the South end of the Isle of *Man* lies a little Islet, divided from *Man* by a narrow channel, called the Calf of Man, on which are no habitations, but only a cottage or two lately built. This Islet is full of Conies, which the *Puffins*, coming yearly dislodge,

and build in their Burroughs. They lay each but one Egg before they sit, like the *Razorbill* and *Guillem*; although it be the common perswasion that they lay two at a time, of which the one is always addle. They feed their young ones wondrous fat. The old ones early in the morning, at break of day, leave their Nests and Young, and the Island itself, and spend the whole day in fishing in the Sea, never returning or once setting foot on the Island before Evening twilight. So that all day the Island is so quiet and still from all noise as if there were not a bird about it. Whatever fish or other food they have gotten and swallowed in the day-time, by the innate heat or proper ferment of the stomach is (as they say) changed into a certain oyly substance (or rather chyle), a good part whereof in the night-time they vomit up into the mouths of their Young, which being therewith nourished, grow extraordinarily fat. When they are come to their full growth, they who are intrusted by the Lord of the Island (the Earl of Darby), draw them out of the Cony holes, and that they may the more readily know and keep account of the number they take, they cut off one foot and reserve it, which gave occasion to that Fable that the Puffins are single-footed. They usually sell them for about nine pence the dozen, a very cheap rate. They say their flesh is permitted by the *Romish* Church to be eaten in *Lent*, being for the taste so like to fish.

"*Gesner* and *Aldrovand* following him, from the relation of a certain *English* man, write that they want hard feathers, being covered only with soft feathers, or a kind of down, which is altogether false, they being furnished with sufficiently long Wings and Tail and flying very swiftly. They say it is a foolish bird and easily taken. We are told that they breed not only on the *Calf of Man*, but also on the *Silly* Islands.

"Notwithstanding they are sold so cheap, yet some years there is thirty pounds made of the young Puffins taken in the *Calf of Man*: whence may be gathered what number of birds breed there."

Sir William Jardine observes: The Calf of Man "becoming more frequented, and a lighthouse being erected, the birds disappeared entirely, and on a visit which we made to this interesting island, we were much disappointed in scarcely being able to trace even the recollection of their former abundance."

Again I make a short quotation from Ray's Willoughby, where under the heading of "The Shear-water," he writes :—

"Our learned and worthy friend *Sir Thomas Brown* of *Norwich*, among the designs and Pictures of many other birds, sent us also that of this, with a short history of it as followeth. The *Shear-water* is a Sea-fowl, which fishermen observe to resort to their Vessels in some numbers, swimming swiftly to and fro, backward, forward, and about them, and doth, as it were, *radere aquam*, shear the water, from whence perhaps it had its name. It is a fierce and snapping fowl, and very untractable. I kept two of them five or six weeks in my house, and they refusing to feed, I caused them to be crammed with fish, till my Servant grew weary, and gave them over; and they lived fifteen days without any food."

On the last plate in this work (tab. lxxviii) is an engraving of "The Sheare-water," which I think we may fairly conclude was copied from Sir Thomas Brown's picture. It is certainly one of the best illustrations in the book, and shows that even at this early date (1678) Norwich could boast of an artist who was a worthy forerunner of that school for which the city has so long been famed.

Before leaving this interesting book to resume my narrative, I may be permitted to make one more extract with reference to the Manx Shearwater.

"In the description of the *Færoe* Islands, written by *Lucas Jacobson Debes*, I find an account of the manner of breeding and taking of some water-fowl . . . which because it confirms and illustrates what we have there delivered, I shall here subjoyn. The *Skrabe*, that is our *Mank Puffin*, comes in *February* about *St. Matthias* day, and fareth away about *St. Bartholomew* tide (August 24th) . . . The *Skrabe* (*Puffin*) builds on the Land under the earth; scraping with its Beak and Claws lying on the back (whence it is called a *Skrabe*), it diggeth a hole in some places a foot deep, in some other eight or ten foot in several turnings, seeking especially to dig itself behind a stone, where it thinketh to lie securest. It is very remarkable that this bird is the whole day away from its Young, and never comes to it but in the night to feed it, and if it flies not from its Young at the dawning of the day, it stays with it the whole day over, and then flyeth

out to sea till the other night cometh. And though the Young be fed but once a day, yet it is so fat, that no Goose, though it hath been three weeks fed, can be fatter. These young ones they call Lyers, and by reason of their fatness they do not make present use of them, but salt them to eat them in Winter, melting their fat, which they burn in Lamps. They have to take them out several hooks half an Ell, or an Ell long, wherewith they pierce them through and draw them out. They do not usually take the Dam herself, except she be sometimes hurt with the hook that she cannot live. If they cannot get the young one with their hook, or by thrusting their arm into the bird's Nest, by reason of the many turnings, they dig a hole down to it, as near as they can guess, and then thrust about with their hooks till they can get it; which hole they must again stop so close, that not one drop of water can come into it, for else she will forsake her hole and never come thither more; which otherwise she doth every year in the wonted place; so that the Inhabitants know where under the earth to find that Bird's Nest yearly."

The only other known nesting-place of the Manx Shearwater on the English coast is Lundy Island; but the colony there is a very small one. There are three places on the Welsh coast that have been recorded by that most careful of observers, the late Thomas Dix; namely, Caldy Island, Skomer, and Skokhum.

Off the south-west coast of Ireland, the Skelligs afford a home to large numbers of this bird. Sir Ralph Payne Gallwey says in 'The Fowler in Ireland,' that "on foggy nights they may easily be caught by means of a lantern. They cannot in thick weather find their holes as they come in from the sea, and squat about on the open ground."

Other small stations are known on the Irish coast; but it is as we proceed up the west coast of Scotland that their haunts become more frequent, St. Kilda being the largest colony in this country.

On leaving the yacht we first landed on a small rocky island called Merrick, where we found, in addition to several nests of the Oystercatcher, two nests of the Common Tern containing eggs, these being the only Terns' eggs found during our visit.

When rowing past Gweal—on which, as we saw nothing but Lesser Black-backed and Herring Gulls, we did not land—our pilot told us that formerly Crows used to nest on the

southern end of the island, but they had not done so for many years past.

Our next landing was on the rock from which the group takes its name—Scilly; a large rock lying to the north-west, and divided in two to the water's edge by a narrow chasm. It is quite bare of vegetation, but is resorted to for nesting purposes by the Guillemot, Razorbill, Puffin, Shag, Herring and Lesser Black-backed Gulls. We picked out a few nicely marked eggs of the two first named species, and then started for Annett, sailing past Castle Bryer, Black Rock, on which we saw a seal basking, Seal Island, and Great Smith. Lying to the south-west of the group, we found Annett to be a long and narrow island, of very slight elevation. When we had climbed over the low rocks, we saw that the surface was covered with a carpet of Thrift; which, being in full flower, made an extremely bright picture under the June sun. Towards the south-eastern end the peaty soil gives place to sandy loam, and this is honeycombed with the nesting-holes of the Shearwaters and the Puffins. We had no difficulty in finding them, or the direction in which they were excavated, for as we went along, whenever we were walking over a nest the ground gave way beneath our feet. Our pilot had provided himself with a shovel for digging out the eggs, but it did not prove nearly so serviceable as the small square trowel which I had brought from home, and which was much less likely to break the egg when digging in its immediate vicinity.

The single white egg of the Shearwater is sometimes placed on the bare earth, but more often on an apology for a nest, composed of dead Thrift or chips and stalks of the Brake (*Pteris aquilina*), at the end of a hole excavated by the bird, from twelve to eighteen inches below the surface of the soil, and varying in length from two to four feet. In every hole we dug into we found one, and, in some cases, both the birds. Many of the holes had several chambers, and in one of them we found both a Puffin and a Shearwater, as well as an egg of each species. The male takes part in incubation as well as the female, for one which we killed had a large bare breeding-patch of the same size as those of the female. When seized, the Shearwaters did not hesitate to use their sharply-hooked beaks, and had I not been provided with a thick leather glove, my hand would soon have been lacerated. In every case the eggs were very much incubated, and although we

did not find any young birds, I was able to hatch out one of the eggs three days later with the help of a hot-water bottle.

Several of the birds which we caught presented quite a dazed appearance when brought out into the light, and upon being thrown up into the air, fell nearly to the ground before finding the use of their wings; but when once they did so, they went off with a rapid flight seaward.

Until last year, Annett was the yearly resort of the Sandwich and Common Terns in large numbers, but through their having been disturbed when breeding, they have quite deserted the island, and the only other birds we noticed were the Oystercatchers, which were here in great numbers, the Lesser Black-backed and Herring Gulls, the Razorbill, and the Rock Pipit. One low cliff of peaty soil towards the north of the island was so riddled with holes made by the Puffins, that it presented the appearance of the nesting-place of a gigantic race of Sand Martins.

We brought away one Shearwater alive, which Mr. Graham presented to the Zoological Society on his return to town; and this bird, when placed in a box with a little sand, immediately endeavoured to provide a hiding place by raking a hole in the sand with its beak, working it in a semi-circle, and at each movement drawing out a little of the sand.

To the south of Annett, at a distance of about four miles, there is a rock called Gorregan, which is a nesting-place of the Storm Petrel: but as we were at least a fortnight too early in the season for eggs of this bird, we did not visit it.

During our sail back to the "Wenonah," I questioned our pilot as to the Scillonian names of some of the birds we saw. In many instances they were the same as used in other parts of Britain, such as:

Razorbill	=	Murre
Puffin	=	Pope
Oystercatcher	=	Seapie

But others were more local, as:

Kittiwake	=	Kiff
Shearwater	=	Crew and Mackerel-bird
Cormorant	=	Colmorn and Cotton Heap
Shag	=	Colmorn
Ringed Plover	=	Tranillys
Tern	=	Merrick

Early on the morning of Tuesday, June 3rd, we started on our homeward voyage. When about five miles from Land's End, at noon, we saw about forty Shearwaters at rest on the sea, and during the afternoon we sailed past another flock of about the same number. We were much disappointed at the very slight information which we were able to obtain regarding the Terns. Rodd, in his 'Birds of Cornwall,' gives four species as nesting at Scilly; namely, the Common, Arctic, Roseate, and Sandwich, a statement which has been copied by several writers. The only two species we identified were the Common and the Sandwich; and as I shared in the views held by some ornithologists as to the incorrectness of the assertion that the Arctic Tern nested there, I was very anxious to settle the point. Most unfortunately, the Terns had been very much disturbed the previous year, in spite of Mr. Dorrien Smith's strict injunctions; and this season they had quite deserted their chief breeding stations, and we were unable to find their new locality. Their having been disturbed had probably made them a little later in laying than usual.

Mr. Burton, who had accompanied us for the purpose of preparing any skins we might obtain, visited the isles again some ten days later, and on his return he informed me that he found eggs of both the Common and the Sandwich Tern on the Island of Guthers, and that the latter species had in all instances placed its eggs on the dried seaweed just above high-water mark, instead of on the bare shingle, which is their more usual custom.

I cannot close my short paper without expressing a most ardent hope, that the Migration Committee appointed by the British Association may shortly be enabled to induce the keepers of the lighthouses at Scilly to take a greater interest in the birds which pass them on migration. From the information we already have of this rich locality, one cannot help thinking that, if a careful report were made, much useful information on the marvellous subject of migration might be obtained, and perhaps many additional species added to the already wonderful list of which I have spoken.

VIII.

THE HABITS AND PLUMAGE OF THE MANX SHEARWATER.

By Rev. H. A. Macpherson, M.A.

Read 23rd February, 1886.

The Island of Eigg is one of the smallest, but incomparably the most beautiful, of the *inner Hebrides*, containing within its limited area an extensive flora, a considerable avi fauna, and the most varied combination of scenery,—wild crags and upland lochs, long stretches of purple heather and deep bedded burns, blending harmoniously with a verdant pasturage of unequalled capabilities. A fine strath, three miles in length, divides the southern portion of the island, including the famous Scuir rock (a pitchstone porphyry formation) from the northern part, Benvui or "the Yellow Mountain." Immediately north of the Laig burn, the ground begins to rise, and rapidly culminates in a long stretch of hill ground, bounded on all sides, except the southern, by a magnificent rampart of precipices, which sweep majestically around the whole northern portion of the island, from Laig Bay to Kildonan on the east. It is upon the shelves of these precipices that the Manx Shearwater burrows in large, though probably decreasing, numbers.

When recently comparing my experiences of the Manx Shearwater with my friend Mr. Edward Bidwell, he was good enough to suggest that a few remarks upon this colony of *Puffinus anglorum* might fitly follow his account of this species at Scilly; and the remarks which follow are chiefly based on the rough jottings which it occurred to me to make when spending some delightful days in Eigg, at the end of June, 1885.

The colony of Shearwaters under consideration is that alluded to by Hugh Miller ('Cruise of the Betsy,' p. 72), and has been

favoured by rapid visits from at least two excellent ornithologists, Mr. J. Dalgleish and Mr. W. Evans of Edinburgh. Since my notes were written, I have had the pleasure of reading the very charming paper in which Mr. Evans recorded his passing impressions, and it is impossible to escape regret that he was unable to spend more than four days (including Sunday, a bye-day) in the island. Since prehistoric times, the residents in Eigg have constantly plundered the burrows of the Shearwater: formerly, they regularly salted them for winter use, and though at present they only relegate their carcases to a saline process for a few days, the birds are much harassed, and nest so largely in the inaccessible portions of the cliff, that, *after* their usual spring raids have been made on the "Puffin," it is difficult to find many undisturbed burrows. Such was the case in 1885 at any rate, when the Eigg men assured me that my search would be to little purpose; and though they assisted me cordially, the vast proportion of burrows proved to be either recently robbed, or not to have been used at all during the season.

It is upon the braes and shelves of the precipices which overhang the bay of Laig, and command a magnificent view of the lofty mountains of Rum, on the other side of a narrow sound, that the largest colonies of Shearwaters prefer to nidificate, at a distance varying from half-a-mile to a mile from the sea shore, and at a height of from a hundred to seven hundred feet (I give the figures only approximately). From the base of these noble cliffs, the limestone formation, strewn with fragments of rock, and enjoying a luxuriant vegetation, sinks gradually to the low rocks which immediately overhang the beach beneath. It is in the softer soil, upon the face of the precipices, where heather grows, that the burrows of this colony are chiefly to be found. They extend in length from three to about five feet, and are fairly broad. Mr. Evans has rightly surmised that in some instances the burrows excavated by *Lepus cuniculus* are occupied by the Shearwater; but, of the large number which I examined, the vast majority had been made by the Shearwater. And when I mention that it is within a hundred feet of the summit of the cliffs that the greater number of the Shearwaters nestle, and that rabbits have been introduced only of late years, and are at present almost entirely confined to the south of the island, the force of the criticism will

at once be obvious. In some instances, I found that a burrow had been disused since the preceding season, when a nestling had hatched out, as testified by the broken egg-shells interspersed with the nest lining. It has been said, and doubtless correctly, that the Shearwater occasionally deposits its one white egg upon the *bare* soil; but, in all the nests I examined, a slight depression about ten inches from the end of the burrow (often round a shoulder of earth) contained about a saucerful of dried bracken, bents and dead leaves, forming a comfortable, though scanty bed for the downy nestling.

As we scrambled along the lower portions of the cliff, we found a number of nests, with varying results. Most were empty, but one held an egg without a tenant; another would yield a couple of birds, but no egg. Subsequently, pursuing the coast line north, my guide pointed out to me several braes covered by fine turf, in which he knew the Shearwater to breed; and clambering continuously, we placed them under examination. The soil here becoming scanty, and loose rocks abounding, the burrows were "runs" rather than tunnels, and it was difficult to arrive at their termination; since, like all the other burrows, they wound directly from left to right, or *vice versâ*. Standing on tiptoe, for there was only a slight projection on which to rest even one foot (my gilly supported me from the side, where he had a firm footing), and inserting my left arm, I felt the bill of a nestling tenderly caressing the tips of my fingers. After enlarging the entrance, again I made a plunge into the interior, drawing out a fine downy bird, about three days old (July 2nd). Previous to this, on June 30th, a native, named Hugh Kate, had conducted me by a sheep track to the grassy slopes on the north-east side of the island, where he thought that the nests had been less disturbed than on the west. As we ascended the lower cliffs, we had a fine view of the bright green and steep braes, which, strewn by splinters of weathered rock, and dotted here and there by bracken and luxuriant tufts of Lady Fern, descended rapidly to the shore, distant from the Shearwaters' nests, perhaps, a quarter of a mile. Here, upon the usual shelves of turf, sprinkled with clover, red and white, and tall heather, there were many Shearwaters' nests, though most of them had been already robbed, a turf being often cut out above the extremity of the burrow.

The holes were generally in company, five or six new and old within an area of twenty yards. Here, as on the west side of Eigg, I found that in a few instances there was but one orifice for two burrows, a single portal serving as the entrance for both nests, which would run right and left respectively. From one such nest we took a brooding female, which we released, but not before it had tasted the blood of Hugh Kate. Diving his arm again into the hollow he produced an egg. Wishing to test the length of the burrow, I followed his example, but as my fingers strayed round the shoulder of the nest (broadest at its extremity) they came in contact with a second egg resembling the first, and like it far advanced in incubation. Hugh Kate considered that I had produced it from my sleeve, and was practising on his credulity. He stated that the fact was new to his extensive experience. No doubt the two eggs were laid by different females. Possibly, the sitting female, which we caught, had ousted an earlier occupant when an egg was newly laid, and had proceeded to incubate both eggs together. At all events, there they were lying on one and the same nest.

Whilst we were examining another nest, from which we had taken a single egg, after throttling as we thought the brooding female, the latter suddenly returned to life, and after a few convulsive gasps, the poor bird fluttered down the slope for a few yards; then, gathering up her strength, she slipped down a little further, and rising from the *uneven* ground, flew off to sea, being soon lost to view.

In another hole we found an old male in rare condition, apparently an old bachelor, at all events a note appears that he "had *no* hatching spot;" he bit with ferocity, and having left his mark, was tossed into the air and departed gaily to sea, displaying his graceful flight to advantage as he curvetted over the waves. Before the day was over, we secured a second young one in down, apparently only about a day old. Evidently they were just beginning to hatch out.

It was on the evening of July 1st that I walked over to the west side of the island to study the habits of the Shearwater at nightfall. As I ascended the shelving ground which gradually rises to the base of the cliffs, wherein many Shearwaters nestle, in company with a shepherd, a delicate drapery of grey cloud was

resting on the peaks of Rum, casting its shadow on the still and silvered waters of the Sound of Eigg. The evening was calm, the tide was full, a Thrush was still carolling among the rocks, the "twee twee" of a family party of Twites announced that they were going to roost in the grey gloaming, though the Cornerake was croaking hoarsely in the low meadows below us. Picking our way through the loose boulders, we reached a position immediately beneath the highest shelf (about seven to eight hundred feet), in which we knew the Shearwaters to burrow, about half-past ten, and listened anxiously for their cries, as we chatted quietly about their habits on our springy couch of heather. It was not until twenty-four minutes past eleven (the evening was light enough to see the hands of a watch) that we *heard* the first Shearwater flying in *from sea*, calling loudly, and answered from the heights above. Ten minutes later, the voices in the cliff began to rise; another and another arrived from the sea, flying apparently in nearly a straight line from the priest's house (near the beach) to the cliff where the burrows were situated. The cry uttered on the wing somewhat resembles the word "cuck-cocko," their voices growing in distinctness as time passes on: others answer on the cliffs; but it is from those which pass us, flying in at a good height on the wing, that the cries are loudest. "There is a good deal of noise, too," quoth the man of flocks, at ten minutes to twelve. And to judge from the cackling and crooning overhead, now rising tumultuously, and then lulling, the fun was becoming fast and furious. By midnight the performers were chorusing famously, and when I left them, half an hour later, the concert was merrily sustained. The shepherd volunteered to walk home with me as far as a steep brae, and just before we reached the summit, a Barn Owl came by, sweeping low over the ground: his discrimination at once identified it as a "white cat"! I strolled home in the faint dawn, serenaded by a sleepless Song Thrush singing in the hazels, a distant Owl hooting a challenge to the unabashed Cornerake.

The Eigg men with whom I discussed the habits of the Shearwater were very communicative, and told me that a few Shearwaters arrived in the first month of spring, *i.e.*, in February; that prior to laying, they excavated fresh burrows, or cleaned out the old ones which they intended to use again, the first eggs being

laid about the middle of May.* They described the birds as being most noisy at night, *during* the progress of their excavations, and again *when* the young were hatched. They considered that the males, which are always in best condition, visit the burrows at night to feed their mates on the food which they have gathered during the day; but expressed their conviction that both old birds foraged for their single progeny, which was prodigiously fat, and left the burrow between the middle and end of August. One of the men, Macdonald, plucked a piece of Sorrel, and informed me that the old birds fed their young partly on this plant for a few days prior to its flying, in order to reduce its bulk. This, I find, Hugh Miller was told in Eigg some forty years earlier.

It has often been incorrectly stated that the Manx Shearwater is chiefly nocturnal during the breeding season; but a moment's reflection will demonstrate the absurdity of the hypothesis, that a bird, which consumes such a quantity of food gathered by active exertion, could satisfy its hunger, and possibly that of its mate, by only venturing abroad during the hours of darkness, which only last from eleven p.m. to two a.m., at the outside, on this north coast in summer.† I have only observed Shearwaters in the *neighbourhood* of the *shore* in the evening and in the very early morning; but have frequently observed large parties flying actively over the waves, apparently feeding, *during the day*. The Eigg men assured me that numbers might be seen fishing all day long in the Sound of Eigg during the breeding season, at a distance of from two to three miles from shore, and I have observed this myself on both sides of Eigg, as well as in other parts of the Hebrides. The fact is, that the Shearwater, like the Petrel (*T. pelagica*), is ill adapted to face its enemies on dry land by day. Those which I released on a smooth superficies of turf, ran with considerable rapidity, but preferred to skulk among the bushes. The phenomenon of finding

* The Rev. N. Mackenzie, minister of St. Kilda, recorded in his diary for 1811: "February.—The Shearwater has come to these islands (St. Kilda group) the latter end of this month. March.—The Shearwater has been caught but not in abundance" (Wilson, 'Voyage round the Coast of Scotland,' vol. ii. p. 75). Probably, *the bulk* of the Shearwaters return to their Scottish breeding stations in April, though a few arrive in February and March.

† The observations of Mr. C. Hart ('Zoologist,' 1883, p. 81) seem to confirm my conclusions.

themselves on dry land during the day is so completely opposed to all the principles of their existence, evolved during successive ages, whilst the Shearwater was gradually becoming specialised from a more generalised ancestor, that they appear to be stupified and dazed if handled or released in daylight, though they bite freely notwithstanding. That they do occasionally fall down on a smooth surface, and remain skulking during the day, is certain. I found the remains of several which had thus perished, one of them having been recently plucked by a Hawk, probably by one of the Buzzards which frequent the island.

Macleod, the man reputed to subsist on Shearwaters, volunteered that he not unfrequently obtained a bird for the pot, whilst it was lying helpless during the day, in the line of flight between the sea and the largest colony. No one can carefully study the actions of the Shearwater on a flat surface, where it carries its belly about half an inch above the ground, the legs being set very far back; or examine the anatomy of the genus, when skinning a bird, without recognising how imperfectly this species is adapted to progress terrestrially. Moreover, as this species never visits the breeding stations during the day, but remains at sea exclusively, it follows that it can only be very imperfectly acquainted with the phenomena which present themselves to its limited consciousness, if stranded on dry land during the day. I do not, however, intend to suggest that the Shearwater remains for twenty hours out of twenty-four at sea every day in the week; on the contrary, it is almost certain, that a bird which gorges so heavily would frequently stay at home two nights and a day after a hearty meal. A young bird, sent to me last August, alive, arrived in perfect condition, though it had fasted thirty hours at least; and as the skins of the males are well coated with a thick layer of fat, and the stomachs I have opened have been full of oil, there can be no reason to doubt that the Shearwater keeps fast-days as well as feasts.

The soft parts of sea birds are so frequently described from skins, that I venture to subjoin the following particulars, which apply both to adults and to downy nestlings (the webs dry yellow). Upper mandible black, grey at the base; lower mandible grey, black at the point; tarsus, in front and inside, pale grey; outer surface banded with *black*, continued along the outside of the outer toe; webs grey, tinged with blackish in the adult, with pink

in the nestling; irides dark brown; interior of mouth pale grey, upper surface of the downy nestling is a delicate fleecy grey, which dries a browner shade; the throat and breast are *white*, and this colour forms an *oval ring* upon the belly (as observed in the two nestlings I captured *in situ*); this *white ring* (lost of course in the skin) *encloses* a *patch* of *grey* down upon the abdomen.

The first nestling I skinned was full of oil, like the adults; the ovary of one of the latter containing a cluster of small eggs on June 30th. The older downy nestling lived for several days in my pocket, on cod-liver oil; it was restless at night, and often uttered a little cry, but during the day was content to remain like a ball of down in its extemporised nest, its head buried in the down.

In August, I received two nestlings in first feather, saved from the pot.* In these, the upper parts are of a uniform brownish black, decidedly deeper than the adult during the breeding season; the throat, breast, and lower parts are white, but not so pure as in adults, some of the feathers of the breast and flanks being tipped or edged with grey. The down leaves the back and wings first; the most advanced of my two specimens only exhibiting a single tuft of down between the legs.

The following brief extract from my notes may serve as an illustration of my views as to the partially diurnal habits of this Shearwater, which on other occasions I have observed resting on the waves.

"July 3rd. Off the Sound of Eigg, three p.m. A small flock of Shearwaters appear,—about two miles from land,—and fly to and fro like restless spirits, now shooting sideways to display their long black wings against the waters, at the next moment showing their white bellies by way of contrast, constantly skimming over the waves with great velocity, flying in company; but followed at a little distance by one or two stragglers."

* The following passage from Capt. J. Smith's (?) 'Historye of the Bermudaes' (reprinted, Hakluyt Society, 1882) refers to the Dusky Shearwater and though this Shearwater is nearly extinct in that locality, it affords a curious parallel to the Hebridean taste for cooked Shearwaters:—"For the cahowe (for so sounds his voice) it is a night bird [evidently much more nocturnal than the Manx Shearwater], and all the daye long lies hid in holes of the rocks, whence both themselves and their young are in great numbers extracted with great ease, and prove (especially the young) *so pleasinge in a dish*, as ashamed I am to tell how many dozens of them have been devored by some one of our northern stomacks, even at one only meale."

IX.

NOTES ON THE FULMAR PETREL (*FULMARUS GLACIALIS*) IN CONFINEMENT.

By G. Smith.

Read 23rd February, 1886.

Between October, 1878, and December, 1885, I have had the pleasure of noting down in my diary fifteen specimens of the Fulmar Petrel, all obtained at or off Yarmouth. The greater part of them were adult, although not all fully adult. Most were of the light-coloured race, but two of the number (which I had brought me alive) were the dark form, and these were rather smaller than the light ones (*cf.* Yarrell's 'British Birds,' vol. iv. p. 5).

The first I had alive was on December 18th, 1879. This I managed, by dint of great care, to keep for a fortnight, feeding it with beef fat and cod's liver. It ejected amber-coloured oil on several occasions when disturbed or handled. It was very much cramped in its legs when brought to me, and could not stand properly, and it died on the 3rd of January.

Last autumn I heard of two captured by the fishermen, but one unfortunately died before it reached our harbour. The fellow to it I received on the 31st October, and I succeeded in keeping this bird alive for ten weeks. The food on which I fed it consisted of beef fat, fresh white herrings cut into small pieces, and sprats, also four small whitings, of which it ate two each day. The average amount taken *per diem* was about seven sprats. When these were not to be had, fat and pieces of herring answered the purpose. I and my boys had the pleasure of cramming it daily; and well do we remember the operation, for the peculiar scent of the bird was retained on our hands long afterwards.

One day my eldest daughter showed it a sprat, and it seized and swallowed it; but on two or three occasions only did I observe it feeding itself. It vomited up oil on three occasions, and certainly attempted to throw it over us. We could see the oil coming up its throat, and when it reached the bill, it shook its head and threw the oil two feet across the place. This is evidently its method of defending itself against enemies. Unfortunately it was much troubled with cramp in its legs; but, on the 29th of December, when I had had it nearly two months, it appeared much stronger, and, strange to say, proved itself a murderer, and very nearly a cannibal as well. Receiving a Bittern *(Botaurus stellaris)* from the "Broad" district, I put a live Greenfinch *(Cocothraustes chloris)*, with one wing cut, into the garden enclosure, where I keep my live birds, to see if it would kill and eat it, as my tame Herons *(Ardea cinerea)* do; but, to my surprise, the Bittern took no notice of the Greenfinch, allowing it to go quite close up to it, and even touch it. But strange to say, the Fulmar seized the little bird and killed it, and with its strong bill mutilated, but did not eat it. If Fulmars could be kept free from cramp, they would live much longer in confinement; but when these birds are captured, it generally happens that it is stormy at sea, and they are put by the fishermen, who have other things to attend to, into any hamper or box which may be handy, and in this way they get cramped and often injured. I consider the Fulmar a harmless bird, and a very tame one. Those I have had alive were taken with the boat's "didle,"—a species of landing-net. They come so close to the fishing-smacks, as to be easily taken, and when taken they do not bite as do the Skuas *(Lestris)* and Gulls *(Larus)*. My Fulmar never liked being disturbed, and preferred to keep to a place of its own choosing. If taken to another part of the enclosure, it at once ran back, and tried to get close to the white-washed wall of the greenhouse wherein it was kept. It may be the wall reminded it of its rocky home on St. Kilda! My captive was a good hand at climbing: by the aid of bill and toes it would get on to a hamper, or any slightly elevated place. It was always delighted to have something to peck at, such as grass or any soft material.

So remarkably retentive is the scent of Fulmar oil, that I have three specimens which were stuffed in 1879, and to this day they

retain a disagreeable odour. The Fulmar must be considered a voracious bird. A fisherman, who shot one in November, 1879 (a very fine light-coloured bird), tells me he captured it by soaking a piece of oakum in colza oil and throwing it overboard into the sea, when the Fulmar, seeing the track of grease on the water, seized the lump of oakum and swallowed it, and was shot in the act of doing so.* As to the dark specimens I have had, I consider them to be immature, as the bill does not appear to be so strong or horny as in the lighter ones I have seen; but Mr. Howard Saunders' remarks should be consulted (*l.c.* pp. 4, 5). The note, or rather noise, made by the Fulmar when disturbed is a *chuck chucking* sound. It appears not to like fresh water much, seldom, if ever, going into it of its own accord. Salt water would naturally suit such an oceanic species best. When I first had my bird, I put it into the Gull tank in my garden, but it evidently did not care much for its bath, and appeared unable to stand the water long. The legs of the Fulmar are very tender, and this is the great difficulty in keeping them in confinement. The bird, whose doings are here described, was dissected after death, and proved to be a male.

* [Mr. W. Pycraft, of Great Yarmouth, obtained in November, 1885, from the stomach of one of the Fulmar Petrels, mentioned by Mr. Smith, a stout barbed steel fish-hook two and a half inches in length, or four inches following the curve, and twenty-eight inches of twisted cord attached to it. After taking this hook with the bait, the Fulmar actually swallowed a second, thrown from the fishing-smack, and was captured.—J. H. Gurney, Jun.]

X.

THE FLORA OF HARLESTON AND ITS NEIGHBOURHOOD.

By the Rev. F. W. Galpin, M.A.

Read 23rd February, 1886.

The subject of this paper is the Flora of a small district of South Norfolk, in so far as it is represented by its flowering plants and ferns. The town of Harleston, its centre, occupies a position on the border of the county, though not actually situated in the Waveney Valley, but a little to the north, on the slope of a shallow depression through which runs a small brook, taking its rise near Long Stratton and joining the border river at Homersfield. The surrounding country lies wholly within the area of the Great Boulder Clay: but this Clay, though it covers all the high lands to a considerable depth, has been so largely denuded in the valleys of the Waveney and its tributary streams, that on their flanks are exposed—to the gratification of local botanists—the fine sands of the Middle Drift.

With this geological formation the natural features of the district correspond. To the north of the town there is a long stretch of upland intersected by only a few streams, fairly timbered, and almost wholly under cultivation. To the east, following the course of the brook, there is meadow land crossed by narrow ditches, and gradually assuming the character of the broad river valley into which it merges about two and a half miles from the town. Toward the south the Clay terminates in an abrupt descent into the alluvial flats of the Waveney Valley. This valley is, on an average, nearly a mile across, though its original limits are now in places obscured by shelving banks of gravel, the accumulated

débris of the adjacent uplands. Before its drainage was better effected by a system of dykes, much wet land was to be found here. To this the present abundance of Rushes and Sedges testifies, as well as the existence of *Utricularia*, *Stratiotes*, and other characteristic plants noted by former observers. On the other side of the border river we enter the high ground of Suffolk, corresponding in its main features to the stiff uplands of the district north of Harleston. Lastly, to the west of the town, tracing the valley of the "beck" toward Stratton, we find the meadow land, which edges it for some distance, gradually being brought under cultivation as the depression becomes less marked, and the level of the surrounding country is attained. Thus it will be seen that the district is, in its present condition, without bog land such as abounds in the upper portion of the Waveney Valley at Roydon and Lopham, without the wide extent of marsh land which borders the lower reaches of the river at Bungay and Beccles, without heath land and open chalk downs such as exist in the western parts of the county; in fact, the Botany of Harleston is the Botany of the clays, gravels, and sands of the Upper and Middle Drift.

Having made a few personal observations on my first acquaintance with this eastern county in the year 1883, it was proposed in the following spring to form a small club of working botanists, for the purpose of collecting information on the flowering plants of the neighbourhood. Many considerations pointed to an opening for such a club, notably the fact that the district had never been systematically worked, nor its particular flora recorded. The area proposed for observation in the first year (1884) was that included by a circle of four miles' radius from the railway station. Owing to the peculiar position of our town, it will at once be perceived that this area embraces much of the adjoining county, and a record of our work would be imperfect without a mention of the Suffolk plants found in our neighbourhood. It will therefore be understood, that in the general enumeration of species, the quotations are made from the complete list, though in the subsequent details of particular plants they are necessarily restricted to those observed in Norfolk.

In the year 1884, according to the corrected list, five hundred and thirty-two species of flowering plants were noted within the

four-mile radius, and about twenty-four varieties, two or more belonging to the same species.

In the year 1885 the circle of observation was extended to a radius of five miles. Eighty additional species were recorded, including the results of a more complete study of the local *Rubi* and *Gramina*.

The total number of species stands, for the two years, at six hundred and twelve. We have, moreover, a list of some thirty or forty reported plants, whose existence we hope to verify in many cases during the coming season. The natural orders *Juncaceæ* and *Cyperaceæ* will also repay a more careful review.

Referring our position to the county divisions adopted by the Norfolk and Norwich Naturalists' Society, we find that Harleston is placed almost on the line of demarcation between the eastern and south-central districts.* We are therefore able to supply the County Flora with localities in two out of its four divisions; and the following details have been extracted from our general list as being "first records" for these respective districts.

*Anemone apennina	e.	—
Ranunculus Drouetii	e.	—
„ arvensis	—	sc.
*Eranthis hyemalis	e.	—
Lepidium campestre	—	sc.
Stellaria aquatica	e.	—
Malva moschata	—	sc.
Geranium pratense	e.	—
„ pusillum	—	sc.
Ononis spinosa	e.	—
*Trifolium incarnatum	e.	—
* „ hybridum	e.	—
Lathyrus nissolia	e.	—
Pyrus malus	—	sc.
Sedum rupestre	—	sc.
Bupleurum rotundifolium	e.	—
Œnanthe fluviatilis	—	sc.

* The actual line passes through our district from Shelton in the north-west to Needham Mill on the River Waveney, about two miles south-west of the town.

Galium anglicum	. . .	c.	—
*Silybum marianum	. . .	—	sc.
Bidens cernua	. . .	—	sc.
*Petasites fragrans	. .	c.	sc.
Atriplex triangularis	. .	c.	—
*Euphorbia lathyris	. .	c.	—
*Crocus vernus	. . .	c.	—
*Narcissus biflorus	. . .	c.	—
Fritillaria meleagris	. .	c.	sc.
*Lilium martagon	. . .	c.	—
Ornithogalum pyrenaicum	.	c.	—

* Introduced.

A few remarks on the peculiar characteristics of our district will prove interesting. As at present observed, it appears especially abundant in plants belonging to the natural orders *Geraniacea*, *Leguminifera*, *Scrophulariacea*, and more particularly in those of the Monocotyledonous orders, *Orchidacea*, *Iridacea*, *Amaryllidacea*, and *Liliacea*. Of the forty-four species belonging to these last-named orders and reported in the latest list of Norfolk plants, thirty have already been noted, and to these may be added *Ornithogalum pyrenaicum* and *Narcissus biflorus*.

On the other hand there are some strange absentees. *Saxifraga tridactylites* has been carefully searched for but cannot be found, though it is said to have existed formerly at Brockdish. *Exanthis crocata*, *Pedicularis palustris* and *P. sylvatica* are unknown as yet: and the natural order *Ericacea* is represented by *one plant* of *Calluna vulgaris*. In the order *Filices*, *Asplenium adiantum nigrum*, *Athyrium filix-femina*, *Aspidium aculeare*, the commonest forms, are absent.

Of the plants hitherto quoted from the list, one indigenous species, *Ornithogalum pyrenaicum*, is recorded for the first time in the county; and for the same reason the following, introduced at an early period and now well established, deserve a mention:—*Anemone apennina*, *Eranthis hyemalis*, *Trifolium hybridum*, *Petasites fragrans*, *Narcissus biflorus*, and *Lilium Martagon*.

Special attention was given last season to the interesting genus *Rubus*; and here also a new species, *R. Salteri*, has been added to

the county list. Subjoined are the names of such species and varieties as have been already identified :—

RUBUS IDÆUS.
„ LINDLEIANUS.
„ DISCOLOR.
„ LEUCOSTACHYS.
„ SALTERI.
„ MACROPHYLLUS (probably var. *piletostachys*).
„ RADULA.
„ KOEHLERI (var. *infestus*). Only in Suffolk district.
„ CORYLIFOLIUS (vars. *conjungens* and *purpureus*).
„ CÆSIUS (vars. *tenuis* and *hispidus*).

In conclusion my personal thanks must be tendered to Mr. Arthur Bennett and Mr. Bagnall of Aston near Birmingham for the kind assistance they have rendered me in identifying the species of this difficult genus; and, for the careful observations which have enabled me to produce this paper, to my friends and fellow-workers, the members of the Harleston Botanical Club.

XI.

METEOROLOGICAL NOTES, 1885.

By Arthur W. Preston, F. R. Met. Soc.

Read 23rd February, 1886.

January.

The weather during the greater part of this month was cold, dry, and gloomy, the mean temperature being about 2 degrees below the average. The night frosts were by no means severe, but for many days together the maximum temperature did not reach 40 degrees, in fact between the 1st and 27th this temperature was only twice exceeded. Heavy squalls of snow occurred on the 12th, covering the ground for two days to the depth of about three

inches. The rainfall of the month was slightly in excess of the average, the greater part falling about the middle of the month. Winds were chiefly from the south and south-east, and were generally very light in character, but blew with considerable force from the north-west on the 11th and 12th, and from the south on the 31st. The last five days of the month were much milder, a maximum temperature of 52 degrees being recorded on the 29th. The maximum, minimum, and mean readings of the barometer and thermometer, together with the amount of rainfall and direction of wind for each month, will be found tabulated at the end of these notes. The readings from a second rain gauge, kept at North Heigham by Mr. J. R. Everitt, are appended for comparison. The gauges are two miles apart.

February.

Mild spring-like weather prevailed nearly throughout the month, the mean temperature being upwards of 2 degrees above the average, and the winds almost constantly from the south, south-west, and west. This was the fourth mild February in succession, the thermometer reaching 50 degrees and upwards upon nine days, and but rarely descending below the freezing-point. A remarkably long continuance of low barometric pressure prevailed from January 28th to February 10th (the mean of the period being 29.12 in.), but with the exception of a gale from the south-south-west on the evening of the 6th, it was unaccompanied by much atmospheric disturbance. The rainfall was but little above the average, although some rather heavy falls occurred on the 4th, 14th to 17th, and 25th. The amount of cloud was large, and bright sunny days but few. This had the effect of keeping back vegetation, which otherwise would, with so high a temperature, have been much in advance of the average.

March.

With the first day an entire change of weather set in, northerly and north-easterly winds taking the place of those from the south and west so prevalent during February. These cold winds continued with much persistency throughout the month, reducing the mean temperature to 2 degrees below that of February, and about

2 degrees below the average. The entire month was a great contrast to the previous March which was 5 degrees warmer, but on the other hand was not nearly so winterly as the March of 1883. The weather was chiefly dry, with an unusually high mean barometric pressure. There was but little snow, although, at the equinox, London and the South of England were visited by a heavy snowstorm. Much bright sunshine prevailed, but the winds were very parching and retarded vegetation.

April.

The cold and ungenial weather which set in in March continued without intermission till the 18th of this month. The second (Easter) week was exceedingly unpleasant from the excessive gloom and almost incessant light rain which prevailed throughout the greater part of it. The north-easterly winds continued till the 18th, when they gave way to south-westerly currents, which produced a sudden and most agreeable change in the weather. The thermometer, which during the first eighteen days of the month had but rarely exceeded 50 degrees, rose on the 19th to 69 degrees, on the 20th to 73 degrees, on the 21st to 74 degrees, and on the 22nd to 72 degrees. Such high temperatures as these had not been recorded in April for nine years past. Each of these four days was nearly cloudless, and more in character with July than April. The remainder of the month was showery but warm, and the effect upon vegetation was most striking. The earlier spring flowers had appeared at about their average time, but the cold winds of March and the first half of April had kept vegetation completely at a standstill. By the end of the month the fruit trees were in full bloom, and most forest trees rapidly assuming their summer foliage.

May.

This was a cold and wet month, being the coldest May for six years, and the wettest for seven years past. Much gloom prevailed, and hardly a day passed without rain. The day temperatures rarely approached 60 degrees, and night frosts were of frequent occurrence. Although the minimum temperature recorded was 31 degrees (on the morning of the 8th), the thermometer on the grass in freely exposed places fell considerably lower. The

barometer oscillated much, and the weather consequently was continually in a very unsettled state. Winds varied chiefly between the south-west and north-west, but although frequently of a strong and squally character, did not upon any occasion attain the force of a gale. Parhelia and solar halos were observed on the 12th and 13th during a brief interval of fine weather, but were speedily followed by a return to unsettled conditions. A remarkable rise of temperature occurred on the 28th, when a maximum of 75 degrees was attained. This was 8 degrees in excess of any other day in the month, but the maximum of the following day was 10 degrees lower. As might be expected the prevailing character of the weather had its influence upon vegetation, some trees not having their foliage fully developed at the close of the month, at which time the Hawthorn had only just come into full bloom. This was later than for five years past.

June.

With the commencement of June the weather improved, and a dry period of three months duration set in. It was, however, a remarkable fact (and a striking feature of the whole summer), that whenever two or three very warm days continued in succession, a northerly current would suddenly set in, bringing with it a great reduction in the temperature. On the 4th and 5th maxima of 83 degrees and 84 degrees were respectively recorded (being extremely high for so early in the season), but on the 6th the maximum reading was but 60 degrees, or 24 degrees below that of the previous day. Again, the maximum temperature of the 14th was 77 degrees; of the 15th 64 degrees, or 13 degrees lower. A further remarkable instance was that the maximum temperatures of the 23rd, 24th, 25th, and 26th were respectively 66, 79, 67, and 60 degrees. The month was, notwithstanding these sudden changes in temperature, extremely fine and bright, rain falling on nine days only to the extent of 0.92 in. The prevailing winds were from the north-east, but these were intermixed with a fair proportion of currents from opposite points. The barometer was for the most part high and steady, the mean being 30 in., and the only depression of note occurred on the 20th inst., when a minimum of 29.54 was recorded.

July.

This was the finest month of the summer, being for the most part extremely fine and warm, and was very dry throughout. There were, however, some repetitions of the sudden changes from heat to cold alluded to last month, the most remarkable being that the maximum temperature of the 11th was 22 degrees higher than that of the following day, the amounts recorded being 82 and 60 degrees respectively. The hottest days of the month, and of the year, were the 25th and 26th, the maxima being 85 and 88 degrees respectively; but on the 27th the thermometer did not rise above 79 degrees, and on the 28th 67 degrees. Rain fell on nine days only, the total being but 0.86 in. Barometric pressure was high and steady throughout the month, the mean being 30.10. A remarkable absence of thunderstorms.

August.

Although the long and persistent drought which characterized the summer continued throughout this month, the cold winds, low temperature, and sunless skies, made the weather appear the reverse of what is usually looked for in August. Anticyclonic northerly winds continued for many days together, the barometer remaining very steady, and although the thermometer rose to 74 degrees on the 10th and 78 degrees on the 16th, it but rarely even reached 70 degrees. The mean temperature of the month was about 4 degrees below the average, and was 8 degrees below that of the corresponding month of the previous year. The night temperatures were not, as a rule, much below the average, although a minimum of 40 degrees was recorded on the morning of the 14th, when a ground frost occurred in exposed situations. The total rainfall was only 0.78 in., this being the third month in succession which yielded less than an inch of rain—the total fall for the three months, June, July, and August, was but $2\frac{1}{2}$ in. The effect of the drought was most marked, the leaves falling from the trees as in autumn, and lying in heaps by the roadsides.

September.

On the 2nd of this month the long-continued drought broke up, and a period of excessive rain set in, continuing to the end of November. Rain fell on twenty-four days in this month to a total

of 4½ in., in fact hardly two days together were without rain: much cloud prevailed, and there was scarcely a fine warm day throughout the month. The thermometer reached 74 degrees on the 15th, but the maxima of the following days being respectively 65 and 58 degrees, another instance, even at this late period, of the sudden change from warmth to cold, which was so conspicuous throughout the summer, is here recorded. On the morning of the 27th the thermometer fell to 33 degrees, and a ground frost prevailed of a greater intensity than had been known for many years so early in the autumn. The barometer oscillated much, and frequent depressions passed over the country, causing winds to blow from all quarters and to constantly shift their direction. The mean barometric pressure was low for the time of year.

October.

The wet September was followed by an October whose total rainfall exceeded that of any month since November, 1878, when the memorable "Norwich Flood" occurred. Had it not been for the drought which prevailed all the summer, there is no doubt that serious consequences must have followed this excessive downpour; as it was, the low-lying lands became flooded by the end of the month. The total rainfall of the month was 6.77 in., falling on twenty-five days. The heaviest falls occurred on the 6th (0.77 in.), the 13th (1.06 in.), the 14th (0.47 in.), the 23rd (1.10 in.), and the 31st (0.63 in.). The mean temperature was about 5 degrees below the average, and the thermometer only reached 60 degrees upon one occasion (the 16th). Winds were chiefly from the west and north-west, the mean barometric pressure very low, and frequent deep depressions passed over the country.

November.

Although a very gloomy and wet month, the rainfall was not half that of October, 3.22 in. being the total. There was, however, a remarkable absence of sunshine, and dull damp weather continued for many days together, without a ray of sunshine to vary the monotony. On the 1st of this month daily readings were commenced from a dry and wet bulb hygrometer, and the result of the observations showed a mean relative humidity for November

of 91 per cent. These observations will be continued, and the results given in future annual notes. The prevailing winds during the month under review were south-easterly and were chiefly light, there being, happily, a remarkable absence of those destructive gales so commonly prevalent at this period of the year. A touch of frost occurred from the 15th to the 18th, and formed a pleasing contrast to the general mugginess which continued throughout the rest of the month. It may not be out of place here to mention that the meteor shower on the evening of the 27th was clearly seen in Norwich. I counted no less than one hundred and twenty-seven meteors between 6.25 and 6.30 p.m.

December.

This month entered with a few mild squally days, giving place on the 7th to the first touches of the somewhat rigorous winter weather which has characterized the season we are now passing through. Snow fell on the 7th, 8th, and 9th, to the depth of about three inches, and remained on the ground for six or seven days. The frosts became sharper nightly, a minimum of 20 degrees being registered on the night of the 11th, which was the lowest I have recorded since January, 1881. With the thaw on the 13th came a return to the damp sunless weather so prevalent during November. Heavy snow occurred on the evening of the 29th, but was speedily thawed the following evening by showers of rain. Winds were chiefly from the west and north-west, but there was again an absence of severe gales. The barometer was very high for the season, being above 30 in. from the 7th to the 28th day, and the mean pressure for the month was as high as 30.13 in.; the rainfall was consequently light, only 1.15 in. being recorded. The mean relative humidity was 90 per cent., which shows that the air was nearly as damp as in November.

Summary.

The weather of the year was more varied in character than that of 1884. A cold and dry January was followed by a mild February and cold March. The spring, with the exception of some warm days in the second half of April, was very ungenial, with a great prevalence of cold winds, and May more resembled

November than the "merry month" of the poet. The only real summer weather of the year occurred in June and July, which, although subject to sudden changes in temperature, were extremely fine, sunny, and dry months. August was cold for the season, but the entire summer was abnormally dry, and was remarkable for an almost total absence of thunderstorms. During the autumn such a quantity of rain fell, that the rainfall of the year, which had hitherto been considerably deficient, was in excess of the average. The total for September, October, and November was 14½ in., as against 2½ in. for the three previous months, and the total for the year was 28.60 in., or nearly 8 in. in excess of 1884. The dulness and gloom which prevailed almost continuously during the last five months of the year are not calculated to leave very pleasing memories of the weather of 1885; but it must be remembered that June and July were very fine and warm, and the summer one of the driest on record, forming a pleasing contrast to the wet and gloomy summers of recent years.

1885.

Month.	BAROMETER.					THERMOMETER.					RAINFALL.				DIRECTION OF WIND.							
	Highest.	Date.	Lowest.	Date.	Mean.	Highest.	Date.	Lowest.	Date.	Mean.	Thorpe Hamlet.		Heigham.		N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
											Inches.	No. of days.	Inches.	No. of days.								
Jan. .	30.37	1	28.73	11	29.82	52°	29	23°	25	35.2	2.25	18	2.33	18	1	3	5	7	8	3	2	2
Feb. .	30.14	21	29.15	16	29.67	56	12	25	21	41.7	2.20	15	2.37	16	1	2	1	0	11	7	5	1
March	30.57	14	29.22	6	30.01	57	20	25	24	39.7	1.40	13	1.31	14	4	10	3	2	2	3	4	3
April .	30.27	19	29.26	6	29.76	74	21	26	4 & 5	48.5	1.51	14	1.31	14	4	11	1	3	5	3	2	1
May .	30.12	12	29.23	22	29.75	75	28	31	8	49.9	3.04	22	2.99	21	5	2	0	1	4	7	7	5
June .	30.36	11	29.54	20	30.00	84	5	37	30	58.7	0.92	9	0.95	10	3	10	2	3	4	3	4	1
July .	30.41	22	29.75	19	30.10	88	26	43	1 & 10	62.1	0.86	9	1.02	8	4	6	4	4	1	6	3	3
Aug. .	30.25	15	29.59	10	29.89	78	16	40	14	58.3	0.78	8	0.60	9	9	4	4	1	2	3	3	5
Sept. .	30.30	22	29.39	11	29.84	74	15	33	27	55.2	4.50	24	4.59	24	3	2	1	1	7	6	5	5
Oct. .	30.16	15	29.07	26	29.68	63	16	32	30	45.2	6.77	25	6.64	26	7	1	5	1	1	4	7	5
Nov. .	30.46	16	29.27	28	29.90	57	29	27	16	41.4	3.22	17	2.92	17	1	2	3	12	3	2	6	1
Dec.	30.52	23	29.39	5	30.13	50	17	20	12	38.2	1.15	11	1.36	12	4	2	0	1	4	1	12	7
Means					29.88					47.8												
Totals											28.60	185	28.39	189	46	55	29	36	52	48	60	39

XII.

NOTES ON THE HERRING FISHERY OF 1885.

By Thomas Southwell, F.Z.S.

Read 23rd February, 1886.

In the present lamentable absence of authentic official statistics with regard to the Fisheries of the English Coast, we are occasionally startled by some item of information which comes to us generally in a rather round-about way, calling attention to the magnitude of this neglected industry. Thus in the 'Field' of 24th October, 1885, appeared a statement to the effect that the various English railways carried from the fishing stations on our coast, in the year 1884, the enormous weight of 248,678 tons of fish, rather more than one-half of which had been brought into the ports of Grimsby (64,077 tons) and Yarmouth and Lowestoft (60,885 tons), and to this must be added the fish taken direct to market by the steam carriers. It seems almost beyond conception that an industry of such magnitude should be carried on almost unrecognised by the State and in an utterly haphazard manner, in season and out of season, and in almost total ignorance of the food, habits, and periods of reproduction of the objects of our pursuit. If a knowledge of the life history of fresh-water fishes is desirable as the first step to their proper conservation, surely it is not less necessary to obtain some insight into the habits of the sea fishes, which represent so much more important an item in the national food supply: yet all that is known with regard to the periodic movements, food, and reproduction of the multitudes of Herring which happily still frequent the seas within easy reach of our most important fishing stations, might be told in a very few words, and the same remarks will apply to almost all the food fishes of the ocean.

The beneficial results which might be expected to ensue, were we to learn something about the habits of these creatures, and to enlist the sympathy of the fishermen by proving to them in what their own interest lay, and then supporting them in their action by mild legislative enactment, has been clearly indicated by the beneficial effects of the Crab and Lobster Act on the Norfolk coast, benefits which the fishermen themselves are the first to acknowledge, and to admit, that they could have been secured by no other means than by parliamentary enactment.

There are two very interesting papers printed in the eighth volume of the 'Proceedings of the Royal Physical Society of Edinburgh,' which show that our Scotch friends are not so indifferent to their own interest as we are; and I should like to call attention to a few of the results of their investigations. In June, 1884, Mr. Frederick G. Pearcey of the "Challenger" expedition embarked on board the smack "Energy" at Leith, for a voyage to the Shetlands fishery, for the purpose of studying the "movements and food of the Herring."

During the voyage of the "Energy" she passed through extensive tracts of dark brown-coloured water, the discolouration being caused by an enormous quantity of Algæ, chiefly *Rhizosolenia shrubsolei*, and these tracts were invariably found to be perfectly barren of fish life, and the presence of this diatomaceous matter he suggests may be one cause of the hitherto mysterious desertions of favourite spawning grounds by the Herring. He is also of opinion that the presence of enormous numbers of Dog-fish may tend to the same effect; in support of which, he says, that in a once famous spawning ground of the Herring off the west coast of Shetland, they came upon immense numbers of the Piked Dog-fish—"the sea for a considerable distance round us seemed alive with them." On hauling their nets they were found to contain only three barrels of Herring, eighty per cent. of which were so badly bitten as to be of no use: the nets also were much injured.

With regard to the food of the Herring, Mr. Pearcey says, that of the vast number which he examined, the stomachs of "fully ninety per cent. were devoid of food material," and it was very rarely he found one containing what might be called a full meal. When that happened it consisted of young fish, such as *Ammodytes*

(Sand Eel), *Motella* (Rock Lings), *Gadus pollachius* (Pollack), "and in some cases these were mixed with a few Copepods, the zoæ stage of Brachyura, *Evadne*, larvæ of Mollusca, Radiolaria, etc." It should be mentioned that, although in no case "absolutely full" Herring were caught, it is probable that this abstinence from food was due to the condition of the fish, which were evidently not far from mature for spawning. The result of Mr. Pearcey's observations are summed up as follows:—*Food*—"After examining my notes on previous investigations upon the same subject I am convinced that the Herring feed upon most, if not all, of the minute animals which live in or near the surface waters of the sea; and wherever these are abundant, there the Herring will be found in the largest quantities. There can be no doubt that the Herring, like most other fish, is a voracious feeder, nothing in the way of food seeming to come amiss. The abundance of food, as well as suitable localities for depositing ova, are in my opinion, the principal cause of their apparently haphazard movements." *Influence of Temperature*—"The temperature of the water does not seem to me to have much, if any, effect on the movements of the Herring; but this may not hold good as far as the propagation of their young on the spawning ground is concerned. It is, however, impossible to draw definite conclusions on such extremely short investigations. It will be for future investigators to show whether the variation of temperature has anything to do with their movements. Where our greatest catch of Herring was taken, the surface temperature was 52.5° when the nets were laid out, and 51.9° when hauled in."

Professor Cossar Ewart, of the Scottish Fishery Board, in the same volume of 'Proceedings,' has some interesting speculations as to the possibility of artificially restocking deserted spawning grounds of the Herring, if it should be found upon investigation that Herring, like Salmon, and possibly many other fish, are in the habit of returning to their birthplace at the spawning period. Professor Ewart suggests the possibility of restocking the beds by sinking stones covered with fertilized Herring ova, and describes an apparatus which he thinks would be serviceable for that purpose. The Herring are believed to reproduce in the second year, and the ova to hatch in from ten or twelve to forty days, according to the circumstances being favourable or otherwise.

I trust I may be excused for this lengthy digest of Mr. Pearcey's paper, and would plead in excuse the dearth of accurate information with regard to the habits of this important fish, and the hope that an indication as to the line of research which is desirable may induce some of our Yarmouth and Lowestoft friends to interest themselves in an investigation which is sure to repay their labour, and may lead to results of the greatest importance to the fishing trade.

The Spring Herring Fishery opened well at Lowestoft both as to quantity and price, but the quality of the fish was what might have been expected of such unseasonable stuff. The first few fish brought in realised from £6 to £7 per last (13,200), but by the middle of March the price had fallen to £3, or much less, according to supply. A little later the quality of the fish improved so much, that one of the reports of the market stated some of them were "good enough to kipper, a process not often undergone at this season of the year;" but so much depends upon supply, that in the end of April, when fish had become scarce and were much wanted for bait, as much as £30 for a single last was obtained.* A few Herring were taken in the month of May, but by the end of that month the boats were more profitably employed in the Mackerel fishery. The spring catch for Lowestoft was 2632 lasts, and that for Yarmouth 659 lasts,—about the usual quantity for the former port, and rather over the average for the latter. It is doubtful whether this spring fishing is very profitable to anybody; certainly it must be a most wasteful proceeding; but the fish would be much missed, being very useful for bait for the line fishing.

During June and July little is done in the way of the Herring Fishery. A few fish are landed with the Mackerel; but by the end of August the Yarmouth boats begin in earnest, and by the commencement of September (Lowestoft is a little later) most of the boats are out; and a more busy scene than the fish-wharves at Yarmouth and Lowestoft at that time and till Christmas cannot be imagined. All is bustle and life, the fishermen landing the silvery beauties from the boats, spreading them on the floor of the wharf,

* This applies to Lowestoft. At Yarmouth, I am informed, the bulk of the Spring Herring are sent away to inland markets, and very few are used for bait.

where they are sold to the highest bidder, counted with marvellous celerity, and despatched by carts to the curing houses, or loaded upon the rail,*—all this to an incessant flow of racy chaff in the broadest vernacular of the district, varied by an occasional eruption of equally pronounced nautical Scotch, which it would be as impossible as it is perhaps undesirable to transfer to paper.

The commencement of the season was a very anxious time for all concerned, as another year like that of 1884 would have been attended with most disastrous consequences to all. There was, at first, no cause for complaint, some of the Yarmouth boats making fine hauls, and the prices averaging well; but as time went on the prospect became less bright, and complaints of the excessive competition on the part of the Scotch boats began to make themselves heard. At Yarmouth there appeared to have been nearly as many Scotch as there were home boats engaged in the fishery, and the question of the size of the mesh in the nets used by the former has become a serious one. I last year explained how very sensitive the market is, and how rapidly a large delivery of small Herrings causes it to decline; and some remarkable instances of extreme variation in prices have occurred during the past season, as much as £25 per last having been paid for fish in the morning, which in the afternoon, in consequence of glut, were not worth more than £7 or £8 for the same quantity. It is said that the Scotchmen use a much smaller mesh than our men, and that in fine weather they flood the market with their undersized fish, greatly to the detriment of all concerned; and this is borne out by the fact that in bad weather, when the home boats, which are larger and better manned than their neighbours, have it all to themselves, the quality of the fish is much better, and the market is not flooded, as is too frequently the case when all the boats can go out. The Yarmouth men therefore regard a spell of roughish weather now and then as anything but an unmixed evil. No doubt these complaints will continue so long as every man is allowed to do what seems good in his own eyes, and no sort of control is exercised over the mode in which the fishery is conducted.

* At Yarmouth the Herring are counted on board the boats, and placed on the wharf in wicker baskets called "swills."

In November, which is the Herring month *par excellence*, there was a great improvement upon the previous month, both catches and prices being fairly remunerative. Some of the boats, towards the end of the month, are reported to have brought in from 10 to 12 lasts, and one, the "Caister Castle" of Yarmouth, on the 23rd November arrived with the enormous quantity of 20 lasts or 264,000 fish. In December the catches rapidly fell off, and by the middle of that month the season was virtually over.

It is difficult to say what the result of the voyage was, as, from the element of uncertainty which pervades all fishing matters, it is impossible from the material available to form anything like an exact estimate of the average price realised by the fish. Some have doubtless done exceedingly well; but on the whole the result, so far as regards Yarmouth, was probably about an average one. From Lowestoft, however, there are serious complaints of the unprofitableness of the voyage. Perhaps the average price might be taken at about £10 per last; and as there were 15,054 lasts taken at the autumn fishery at Yarmouth, and about 600 boats employed, and 6804 lasts and 400 boats at Lowestoft, this valuation would give £250 per boat for the former port, and £170 for the latter; but as a large number of the boats at each port were strangers of smaller size, and carrying fewer nets than the home boats, this element would have to be allowed for in anything like an accurate estimate of the return.

The total catch of the year, as will be seen by the table appended (for the particulars of which I am indebted to Mr. H. Teasdel, Jun., the Corporation Accountant at Yarmouth, and Mr. Massingham, Harbour-master of Lowestoft), was 16,509 lasts for the former port, and 9511 lasts for the latter, or a total of 26,020 lasts against 38,258 lasts in 1884. The number of boats sailing from the two ports was about 595 English, manned by some 6245 men and boys, and about 400 Scotch and others, carrying some 2800 hands.

The size and quality of the fish have been decidedly superior to those of 1884. In October and November I measured many fish from 10 to 11 in., which appeared to be fair samples of the bulk, and in one very fine lot fish measuring 12 and 12¼ in. were by no means scarce.

RETURN OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1885.

		Yarmouth.			Lowestoft.		
		Lasts (13,200).	Thousands (1200).	Hundreds (12).	Lasts (13,200).	Thousands (1200).	Hundreds (12).
Spring	January	—	—	—	—	—	—
	February	8	4	1	11	2	7
	March	293	3	5	861	1	1
	April	331	8	3	1416	7	9
	May	25	8	9	343	7	0
Summer	June	—	7	3	—	2	7
	July	55	8	2	—	—	—
	August	738	6	8	74	2	0
Autumn	September	3194	2	2	160	3	3
	October	3898	7	6	1783	9	5
	November	6773	4	4	4169	1	1
	December	1188	1	3	690	7	4
		16509	2	6	9511	4	7
		9511	4	7			
		26,020	7	3			

NOTE.—Since the above was written, there appears to be a prospect of England sharing the privileges already accorded to Ireland and Scotland, by the formation of a Fisheries Board. The want of such an establishment has long been severely felt, and it must be a matter of great satisfaction that at last a branch of industry of such vast and increasing importance as the Sea Fisheries of the English coast will receive the attention which has hitherto been so strangely denied to it. In order to be truly effective, however, I venture to think such a Board must not confine its labours exclusively to the collection of statistics, much as such information is required. It has a far more important duty to perform. Whilst fully agreeing with the expressed opinion that the "practical" element (by which I understand fishermen and boat-owners to be meant) should be duly represented on the staff of such an establishment, it appears to me that we cannot do better than follow the excellent example set us by the United States of America, at the head of whose Fishery Commission is one of the most distinguished naturalists of the United States. It would be as unreasonable to require a trained biologist simply to collect statistics as it would be to ask such a man to collect the corn returns: this duty should be entrusted to special

members of the staff, all of whom should be under the same head, but there is far more important work for the chief to perform, and that such as only a mind trained to accurate observation could satisfactorily accomplish. With the aid of a small but efficient staff, it should be his duty to collect evidence from the fishermen on any special subject which might arise, for the information of the government, or with a view to legislation. He should also from time to time personally inspect the fishing grounds; conduct investigations as to the habits, food, distribution, and reproduction of the various food fishes of our seas, in which he might probably be largely assisted by the Marine Biological Stations which will doubtless soon be established on our coasts; and last, but not least, it should be his duty to obtain accurate information with regard to the enemies each species has to contend with, and the best means, if any, for affording them protection, more particularly in the early stage of their existence. Useful information of this description could not possibly be supplied by the fishermen themselves: none but trained experts would be able to discriminate either what to observe, or in what manner the observations should be conducted, and the collection of such data would involve an amount of skill only equalled by that required to form reliable deductions from the facts observed. The experience to be obtained by such investigations, if properly applied, would, I believe, be beyond all price, and might lead to a vastly increased supply of fish and Molluscs, under such circumstances as would entail no risk of exhaustion from over fishing or undue destruction of immature fish; indeed, a better knowledge of the spawning grounds might teach us to avoid certain spots at particular seasons very much to our ultimate advantage, and even enable us to replenish the stock of fish by means of artificial propagation. All this could only be worked out by trained biologists, and it is for this reason that I trust a scientific head may preside over the English Fisheries Board whenever such a body is constituted. The annual reports of such a body could not fail to be of the greatest value in every way.

XIII.

NORFOLK AMBER.

By Clement Reid.

Read 30th March, 1886.

Since the communication of my last note on Norfolk Amber, I have made another visit to Cromer. Few fine specimens have recently been found; but Mr. J. Fox, of Jetty Street, placed in my hands three pieces containing flies. These were obtained, among others, in the rough state, from fishermen, but the exact locality of each specimen is unknown. However, there is no reason to think that they are not genuine Norfolk specimens, for the flies were not discovered till the Amber was in Mr. Fox's possession, and was being polished.

Like the previously discovered specimens of Diptera, these were sent to Mr. G. H. Verrall, who writes that:—"The specimen in the brooch is a *Platyura*, of which Loew knew sixteen Amber species. The characteristics of this one are the long antennæ with long narrow joints, the yellow wings with *hairy veins*, the upper fork of the second vein ending in the costa, not very abruptly; the thorax seems to be blackish brown, the pleuræ light brown, but considerably greenish above and on sides of thorax (? through some foreign coloring matter); the abdomen seems also to have some metallic colour; both thorax and abdomen bear numerous blackish bristly hairs; the halteres, legs, and coxæ, are light brown; the femora darker beneath; the front femora bear bristles beneath, rather stronger than the other usual small bristles; the coxæ bear numerous hairy bristles; the tibiæ have one light brown spur at the tip; the tarsi are rather longer than the tibiæ, the basal joint being a little shorter than the other four together, and bearing beneath middle pair about six small well-separated bristles (? in pairs)."

"The other *Platyura*" [in the unpierced bead] "is a female,

and has shorter, closer antennæ; and, I think, the disc of the thorax is yellowish brown, with the sides black; while the pleuræ seem to have a largish bright yellow spot in front, near the humeri; behind which is a smaller blackish spot; then above the coxæ is a second larger bright yellow spot, elongated above which is a second blackish rounded spot, larger than the first, and bearing short yellow hairs, also in front of the second yellow spot is a third blackish spot; the edge of the abdomen is bright yellow, and the upper side conspicuously fasciated, the basal three-fifths of each segment being dark, and the last two-thirds dull yellowish; the belly is duller yellowish brown; the knees and tips of the tibiæ are blackened, the spurs are longish and dark. The wings seem darker than the first species, and the upper fork of the second vein more abrupt."

"In the bead is a small *Xiphandrium* (?). When Loew's paper appeared this genus was included under *Rhaphium*, of which he says, only a few little notable species occur. This one has a somewhat metallic greenish thorax and broad frons. I think I can detect a smallish free hypopygium with some long hairs, and the long narrow antennæ with terminal arista; the anterior femora are thin and longish, and, I fancy, dark with yellowish bases; possibly the hind metatarsus is thickened in some way. The third and fourth wing-veins run parallel, and the large cross-vein is twice its own length from the edge of the wing."

"Thus you will see all three species are fairly examinable, and they are not far from existing British species."

The fauna of the Norfolk Amber now include the following species, all of which have first been recorded in these 'Transactions':—

RHYNCHOTA.

APHIS, larvæ.

DIPTERA.

CECIDOMYIA ? sp.
CHRYSOTUS, sp.
LEIA, sp.
PLATYURA, 2 sp.
XIPHANDRIUM, sp.

ARANEINA.

LINYPHIA (*Bathyphantes*), sp.

XIV.

NOTES ON A FEMALE SPECIMEN OF *PERNIS APIVORUS*.

By J. H. Gurney, F.Z.S.

Read 30th March, 1886.

Amongst the Raptorial Birds occurring in the British Islands, no species is more interesting as regards the variations of marking and colour incident to its changes of plumage than the Honey Buzzard (*Pernis apivorus*), and any facts bearing on these changes are, I think, worthy of record.

With this view I have made some notes relating to a Honey Buzzard which I kept alive for nearly four years and a half, and these I propose to lay before the Society in the present paper. I ought, however, to mention that the earlier observations which I made have already appeared in print in the Appendix J of my 'Catalogue of the Diurnal Birds of Prey,' but I recapitulate them on the present occasion in order that the entire sequence of changes up to the time of the bird's death may be placed on record.

The Honey Buzzard is an occasional visitor to various parts of England, generally appearing in the early autumn, and usually in immature plumage. These migrations are for the most part those of isolated individuals, but in some years a very considerable number of these birds appear at about the same time, and on such occasions they occur with especial frequency in the Eastern Counties.

The last time when Norfolk and many adjacent counties was so visited by this species, was in the latter part of September and the early days of October, 1881.

On September 24th in that year, a Honey Buzzard was observed attacking a Wasps' nest in a hedge-bank at Southrepps, where it had excavated a hollow large enough to contain itself during the process of scratching out the Wasps' nest. A farm labourer drove this bird away from the Wasps' nest seven or eight times, but it persistently returned, till the man put a rabbit-trap in the hole that it had dug out and speedily captured it.

But little injury was caused by the trap, and the Honey Buzzard was purchased by me four days after it was caught, and remained in my possession till its death on March 6th, 1886. It was a remarkably tame bird; as an instance of which, I may mention that, after it had accidentally escaped from captivity, about two months subsequent to its original capture, it allowed itself to be caught again by the hand, though it had the full use of its wings, on the man who usually fed it offering it a meal of its accustomed food.

During the time the bird was in my possession it was chiefly fed upon Rats; but its most favourite food consisted of Wasp Grubs, which it extracted from the comb with great avidity, and with which I caused it to be well supplied whenever they were to be had. In the spring it fed largely on Sparrows' eggs, besides which its food was varied with Frogs and Mice. Its health always appeared to be good, and it was plump, and even fat when it died. Its death took place on March 6th last, which was a very cold day: it appeared perfectly well in the morning, but was found dead in its cage in the afternoon.

The colour of the plumage of this specimen, when first caught, and perhaps still more conclusively, that of the iris, indicated that it was a young bird, hatched during the spring of 1881. The irides, when the bird first came into my possession, were a very dark brown, as also was the entire plumage; the latter, however, being somewhat glossed with purplish reflections on the mantle.

By the latter part of January, 1882, the scapulars had become slightly paler, and the inner webs of the greater and median wing-coverts decidedly so; the irides had also slightly changed, having lost a little of their intensely dark brown colour and having acquired a tinge of bluish. On April 1st, 1882, I noted some further progress in these changes; by that time the irides had assumed a greyish-yellow stone-colour, and the general plumage

of the bird, which had not been moulted, had become much paler, and presented the appearance of having considerably faded.

At the end of July, 1882, the Honey Buzzard was in full moult, and its new plumage presented some very remarkable variations from that which it had previously worn. The following particulars of its new phase of coloration were noted by me on September 4th, 1882, when its moult had considerably progressed, but had not been fully completed. The head had become white, but with a dark brown centre to each feather excepting those of the cheeks and ear-coverts, which were entirely white; the white of the head was also varied by a patch of brown, which extended from the bill to the eye, and for nearly half an inch above the eye, as well as slightly behind it; the feathers of the neck became white, but with dark centres, larger than those on the feathers of the head; the upper scapulars, and also the inter-scapulars, were dark brown broadly tipped with white; the lower scapulars were dark brown, that hue being deepest towards their tips; the lesser and median coverts were still unmoulted, but the greater coverts exhibited new feathers, which were brown mingled with white; the secondaries and tertials were of two shades of brown, the shaft-marks and two cross-bars being darker than the remainder of the feather, these feathers were also tipped with white; the tail was of a rather pale brown, with four very distinct transverse bars of dark brown; the upper breast became white, with brown centres to the feathers, these centre spots were sagittate in shape and of various sizes, but for the most part large in proportion to the extent of the feather; the lower breast feathers remained unmoulted and of a somewhat pale faded brown, and some similarly coloured unmoulted feathers remained scattered over the abdomen, which elsewhere had become white: the under wing-coverts and the under tail-coverts were white, transversely barred with brown.

During the succeeding autumn and winter months the moult did not appear to make any progress, but it was resumed in May, 1883, and was very gradually completed during the ensuing summer and autumn, without, however, producing any further changes of coloration, except the following, which had taken place by July, 1883. The brown mark near the eye had then disappeared; a portion of the white feathers on the cheek showed dark centres; some of the feathers of the median wing-coverts had been moulted,

and the new feathers which replaced them were dark brown tipped with white; the interspaces on the secondaries between the dark bars had become decidedly tinged with grey; the flanks and abdomen were white, with broad transverse bands of brown; the irides were at this time of a very pale straw colour, with an extremely slight tinge of green just perceptible; this, however, disappeared during the ensuing autumn, and the irides then assumed a clear pale yellow colouring, and so continued without further change till the bird died.

On September 24th, 1884, I again carefully noted the following particulars of the state of plumage in which the Honey Buzzard then was. The crown of the head and nape were at that time dark brown with whitish-brown margins to the feathers, these pale margins were largest in proportion on the lores, but the centres of the lore-feathers were coloured like those of the crown; the ear-coverts were wood-brown with fine dark shaft-marks; the mantle was dark wood-brown, but with paler margins to the lower (or terminal) portion of all the feathers; the primaries showed greyish-brown interspaces between three dark cross-bars and a dark tip, the greyest portion of these interspaces being on the upper part of the outer web; the tail exhibited three shades of brown, the darkest being apparent on two broad cross-bars and at the tip, and the palest in the interspaces, but these paler interspaces were intermediately crossed by several narrow transverse bars of a third shade of brown not quite so dark as that of the broad cross-bars, but darker than the pale portion of the interspaces; the feathers of the upper breast were dark brown with narrow pale brown tips, and those of the lower breast and abdomen were similar, but many of them exhibited, more or less distinctly, a white base.

The general appearance of the bird remained very much as above described till it died on March 6th, 1886. But I then observed that a slight change of coloration had occurred in the interim from the disappearance of all the pale margins and tips from the feathers of the mantle and of the upper breast, and from the edgings of the feathers of the head having become merely pale brown instead of whitish brown. On examining the feathers of the abdomen and the under tail-coverts more closely than I had been able to do during the life of the bird, I found that they had white bases, narrow white tips, and a broad

intermediate white transverse bar on each feather, the remainder of the feather being brown. At the time of the bird's death, the greater part of the tail feathers had been either moulted or worn off, and had not yet been renewed; but with this exception, and that of several old primaries which still remained unmoulted, the bird had acquired a full new plumage at the time when it died.

I may add that I could not at any time detect any grey colouring about the head of this specimen, and I attribute this to the fact (which I ascertained by dissection) of its being a female bird. I may also mention that the ovarium appeared to be quite healthy, but the ova were small, the largest being only about the size of snipe-shot, and most of them much smaller.

It will be seen by a reference to the details which I have recorded that this specimen successively exhibited three distinct phases of plumage, much resembling three of the figures given by Mr. Dresser in the article on *Pernis apivorus* in the sixth volume of his work on the 'Birds of Europe.' Its plumage, when first caught, was like that of the young male from Sarepta, represented by the left-hand figure on plate 364, but decidedly darker, especially on the under parts; its second plumage resembled that of the Horning specimen (figure No. 1 on plate 366), but with a rather larger admixture of brown on the head, neck, and under parts; whilst the dress ultimately attained was very similar to that of the old female whose portrait forms the left-hand figure on plate 365. I ought, however, to add that plates 364 and 366 represent the irides as having a tinge of orange, which never existed in my specimen.

Mr. Dresser, at page five of his volume above referred to, states that the second of these phases of plumage is so rare, that he can scarcely consider it to be a normal stage, but rather to be due to individual variation, and in this view I am disposed to concur.

XV.

MISCELLANEOUS NOTES AND OBSERVATIONS.

Læmargus microcephalus. A specimen of the Greenland Shark was captured at Caister near Great Yarmouth on the 11th November, 1885. It was observed floundering amid the breakers in shoal water, and after being lassoed was dragged ashore. It was reported to have lived for some time after landing. Scoresby, in his work on the Arctic Regions, refers to the insensibility to pain of this animal and the extreme difficulty of killing it. I saw this specimen four days after capture; it was then exhibited in Yarmouth Market-place. Its colour was ashy-grey, length about thirteen feet. It was said by the exhibitor to have measured fifteen feet when first captured. The irides were blue, the pupil emerald green. I observed no parasites (*Lernæa*) attached to the eye, as is very frequently the case with this species. Both upper and lower jaws were armed with three rows of teeth, those in the upper jaw agreeing with the plate in Yarrell's 'British Fishes,' vol. ii.—H. W. Feilden.

Great Bustard. I wish to correct a statement I made last year in a little book published by Jarrold and Sons, as it might possibly lead to confusion hereafter. I have described the capture of a Bustard on my estate at Herringfleet about the year 1847. Now it appears this bird was not killed at Herringfleet, but at Elveden in 1815, and was given to my late father (Henry M. Leathes) by his cousin, the Rev. George R. Leathes, by whom it was purchased at Bury St. Edmund's, and eventually presented to the Norwich Museum in my name (Hill M. Leathes) in the year 1844. A letter describing this bird, and the above particulars, was written many years ago by my late father to Mr. J. H. Gurney, and there is no doubt this is an authentic account. Full particulars of this occurrence are given in Stevenson's 'Birds of Norfolk,' vol. ii. p. 33.—H. Mussenden Leathes.

Botanical Notes, 1885. Two new species have been added to the Flora of the County this year, *Goodyera repens*, Br., and *Ammophila baltica*, Link. The former was found at Westwick, on the occasion of the Society's excursion there on July 8th, by Miss Southwell, and the latter at Caister near Yarmouth by Mr. Glasspoole.

Several other curious or local plants were found at Westwick, among them :—

Vicia tetrasperma.
Hypericum elodes.
Monotropa hypopitys.
Lysimachia vulgaris.
Littorella lacustris.
Juncus supinus.
Carex pseudo-cyperus.
Lastrea oreopteris.

About a week after the excursion the Decoy Wood was carefully searched, but no further specimens of *Goodyera*, beyond the large patch first seen, could be found.

The variety of *Sonchus arvensis* found by Dr. Long at Wells, as recorded in last year's Notes, has been named by Mr. Arthur Bennett *S. arvensis* var. *angustifolius*, Meyer. It is new to the British Flora, but has been found in the East Friesian Islands.

Mr. H. T. Mennell of Croydon kindly sends a list of plants observed by him in East Norfolk this summer :—

Ranunculus circinatus. Horning, Stalham, Potter Heigham, Lessingham.

Ranunculus lingua. Stalham, Heigham Sounds, Lessingham, Filby.

Sagina nodosa. Stalham. Very fine.

Stellaria glauca. Lessingham.

Prunus cerasus. Hedges, Happisburgh, abundant.

Rubus vestitus, W. and N. Happisburgh, *fide* Baker.

Rubus dumetorum var. ferox, W. and N. Happisburgh, *fide* Baker.

Rubus hirtifolius, Mull. Happisburgh, *fide* Dr. Focke, *non* Baker.

Rubus ulmifolius, Sch.=discolor var. dissectus. A very striking and beautiful variety with deeply cut leaves, not infrequent in lanes near Happisburgh. Baker says: "What a curious form. I never saw anything like it."

Rubus "melanoxylon, or near it." Dr. Focke. Baker says: "I think it a form of *Rubus umbrosus*, Arrh.=*Rubus macrophyllus* var. *umbrosus*." Happisburgh.

Rubus corylifolius sublustris. Happisburgh.

Myriophyllum pectinatum. Horning.

Hippuris vulgaris. Stalham, Horsey, Lessingham.

Ribes nigrum. Cockshott Broad, Ranworth.

Cicuta virosa. Stalham, Heigham Sounds, Filby.

Sium latifolium. Stalham, Heigham Sounds.

Peucedanum palustre. Stalham, Horsey, Lessingham, Somerton.

Œnanthe crocata. Horning.

Œnanthe phellandrium. Barton.

Heracleum sphondylium var. angustifolium. Plentiful about Happisburgh.

Sambucus ebulus. Lanes near Happisburgh lighthouse.

Carduus pratensis. Between Horning and Ranworth, abundant.

Hieracium umbellatum. Plentiful between Happisburgh and East Ruston.

Rumex maritimus. Happisburgh.

Polygonum minus. Horning.

Liparis læselii. Ranworth; a new station, very abundant.

Ruscus aculeatus. Between Walcot and Ridlington.

Juncus obtusiflorus. Stalham.

Alisma ranunculoides. Heigham Sounds, Barton Marshes.

Sparganium minimum. Lessingham.

Acorus calamus. Stalham.

Potamogeton zosterifolius. Stalham; abundant.

Potamogeton trichoides. Ditches, Lessingham; a new station.

Zannichellia pedicillata. Horsey.

Cladium mariscus. Cockshott Broad, Stalham, Somerton.

Scirpus fluitans. Lessingham; abundant.

Carex disticha. Lessingham.

Carex teretiuscula. Barton.

Naias marina. In an entirely new station; very large.

The Rev. E. F. Linton sends the following notes :—

Papaver rhœas, L., var. strigosum. Cultivated fields, Sprowston.

Rubus salteri, Bab., var. calvatus. Border of a wood, Sprowston.

Rubus macrophyllus, Weihe, var. amplificatus, Lees. Sprowston.

Rubus pallidus, W. and N. Found in a copse in Sprowston bordering on Rackheath, and new not only to Norfolk but to Britain. The Bramble which has hitherto passed under this name has been shown by Dr. Focke to be a mere variety of *R. kaehleri*; and Mr. Baker, in his recent paper on British Rubi, excluded *Rubus pallidus* altogether. The name, however, may now be inserted again, Dr. Focke having seen and named one of my specimens.

Rosa echinocarpa ? Ripart. Dry field bank, Sprowston.

A very marked variety of *Rosa rubiginosa*, for which I can as yet get no better name than the above. It goes beyond the only continental specimen I have of *R. echinocarpa* in glandular fruit; and differs from *R. rubiginosa* (on the same bank *e.g.*) in its very bristly ovoid fruit, hardly mature till December.

Rosa canina var. dumetorum, Thuill. Hedge on the borders of Sprowston and Rackheath. Also probably between Gunton and Trunch, but with flowers only I could not be certain.

Pyrus malus, L. There are two forms of this, which do not seem to have been distinguished in the county. *P. mitis* I have found at Thorpe by Norwich, and near Thetford. This is the commoner form I think. *P. acerba* is rather plentiful near Thetford, towards Rushford.

Filago spathulata, Presl. Found at Wroxham by the Rev. W. R. Linton, and in a shady lane at Hellesdon by myself. This has been recorded for one place in West Norfolk; but is new in this division of the county.

Thymus chamædrys, Fries. Healthy pasture on the borders of Thorpe and Sprowston.

Potamogeton pusillus, L., var. tenuissimus. Marshy ditch, Norwich to Hellesdon.

Chara fragilis, Desv., var. fulcrata. Narrow inlet of Hoveton Broad.

A list of plants found at Upton with Mr. Southwell, July 16th, and at Flordon with Mr. Glasspoole, Aug. 17th, may be interesting.

UPTON.

Ranunculus lingua
Lathyrus palustris
Myriophyllum verticillatum
Utricularia vulgaris
Lysimachia vulgaris
Pyrola rotundifolia
Carduus pratensis
Anagallis tenella
Scutellaria galericutata
Nymphœa alba
Eupatorium cannabinum
Rubus cœsius
Comarum palustre
Typha latifolia
Sparganium ramosum
Myrica gale
Stratiotes aloides
Orchis incarnata
Orchis maculata
Gymnadenia conopsea
Habenaria bifolia
Listera ovata
Epipactis palustris
Cladium mariscus
Schœnus nigricans
Carex paradoxa
Carex glauca
Carex panicea
Carex flava
Calamagrostis lanceolata
Hordeum pratense
Lastrea thelypteris

FLORDON.

Inula dysenterica
Malachium aquaticum
Utricularia minor
Parnassia palustris
Eupatorium cannabinum
Molinia cærulea
Schœnus nigricans
Veronica anagallis
Veronica reccaburga
Verbena officinalis
Carduus lanceolatus
Carduus palustris fl. albo
Carex ampullacea
Juncus obtusiflorus
Juncus glaucus
Viburnum opulus
Solanum dulcamara
Iris pseudacorus
Leontodon hispidus

Parts of the Fen which last year showed *Utricularia vulgaris* and *minor* in flower abundantly were so dry this year that I walked freely over them.

With reference to a specimen found at Flordon on this occasion, I have received the following note from Mr. Arthur Bennett :—

"When at Mr. Glasspoole's a few weeks ago, he gave me a specimen of *Sparganium* from Flordon, that I thought must be my

friend Beeby's *S. neglectum* (which he found in Surrey, and figured and described in the 'Journal of Botany'). The other day I showed it to him, and he confirmed it, and says it is undoubtedly his plant. At present it is quite limited to England (in Great Britain): not one of the many Scotch specimens received have been it—all *ramosum*. Mr. Fryer cannot find it in Cambridgeshire, although he has searched miles of ditches. It has been gathered in Surrey, Sussex, Salop, etc."

Mr. Bennett kindly promises to send some specimens of this *Sparganium* for exhibition at a meeting of the Society.—H. D. Geldart.

XVI.

FAUNA AND FLORA OF NORFOLK.

Part XI. Birds. Section I.*

By J. H. Gurney, Jun., F.L.S., and Thomas Southwell, F.Z.S.

(Members of the British Ornithologists' Union).

Read 30th March, 1886.

If the county of Norfolk possesses an avi-fauna rich beyond the average, it is not the less fortunate in having produced a long line of naturalists, who have left most valuable information for the benefit of their successors. The le Strange 'Household Book,' commenced as early as the year 1519, although kept for quite a different purpose, embodies some useful and curious information with regard to the birds found in North Norfolk at that time, and used for food, as well as of their relative scarcity or abundance, as indicated by the money value attached to each species. Some one hundred and fifty years later, we have Sir Thomas Browne's

* Want of space renders it imperative that a portion of this list should be deferred until the next issue of the Society's 'Transactions.'

'Account of Birds found in Norfolk,' written about the year 1663, which for accuracy and shrewdness of observation has never been surpassed.* Another long period then intervenes, and in 1826 appeared Sheppard and Whitear's 'Catalogue of Norfolk and Suffolk Birds,' to be followed in 1829 by 'A list of Birds found in Norfolk,' by John Hunt, the author of an illustrated 'British Ornithology,' never completed; a 'Sketch of the natural History of Yarmouth,' by C. J. and James Paget, in 1834; 'Observations on the Fauna of Norfolk,' by the Rev. Richard Lubbock, in 1845 (a second edition in 1879); 'An account of the Birds found in Norfolk,' by J. H. Gurney and W. R. Fisher, published in the 'Zoologist' in 1846; and last, but by far the most important contribution to Norfolk Ornithology, because embodying all that preceded it, combined with an immense amount of personal observation, the 'Birds of Norfolk,' by Mr. Stevenson, consisting of a series of monographs of the Norfolk birds, as instructive as they are charmingly written.† The first volume appeared in 1866, the second in 1870, concluding with the Red-necked Phalarope; and the third, and perhaps the most important portion, so far as the ornithology of this county is concerned, to the regret of all who have studied the two preceding volumes, is, from causes over which the author has had no control, still in abeyance. In addition to those already named, a host of ornithologists have lived in, or have been connected with Norfolk, amongst whom may be named Robert Marsham of Stratton, Bishop Stanley, Lilly Wigg, Stephen Miller, Girdlestone, Robert Hamond, Robert and John Scales, Salmon, Thomas Dix, Edward Lombe, Anna Gurney, Clough Newcome, and Robert Rising; and, equally well known in other departments of natural science, Robert Arderon, the Hookers, John Lindley, J. E. Smith, Kirby, Sedgwick, Dawson Turner, Brightwell, and the Woodwards.‡

* For a comparison of the avi-fauna of the County at various periods, see a paper on "The Ornithological Archæology of Norfolk" (Trans. Norfolk and Norwich Nat. Soc. vol. i. (1870) p. 14).

† In addition to those enumerated, lists of the Birds of Norfolk appeared in White's 'Directory of Norfolk' in 1864 and 1883, by Mr. Stevenson, and in Mason's 'History of Norfolk' in 1884, by Mr. J. H. Gurney, Jun.

‡ Biographical notices of many Norfolk Naturalists will be found in the volumes of the 'Transactions' of this Society.

These distinguished predecessors have been succeeded by many who, in the present day, earnestly strive to emulate those who have gone before.

Many, of course, are the changes which have come over the face of the county, particularly in the early part of the present century, when the high price produced by cereal crops* gave an impetus to the enclosure and cultivation of waste places, which totally altered the appearance of large tracts of country, nevertheless, there are still remaining ample tracts of heath, wood, water, and marsh, which possess irresistible attractions for the migrants which constitute so large a feature in the bird fauna of this county. We cannot here enter into a more particular description of the physical features presented by Norfolk, but must refer the reader to the introductory chapter of the 'Birds of Norfolk,' which gives a most admirable description of the well defined districts into which the author has there divided the county. Of the appearance and former and present inhabitants of the Broad district, one of the present writers has endeavoured to convey some conception in the introduction to the second edition of Lubbock's 'Fauna of Norfolk;' and on the decoys, which still form so interesting a feature, the same writer has contributed a paper to the 'Transactions' of this Society, which will be found in vol. ii. p. 538.

Reference in the notes which follow is so frequently made to the migratory habits of many birds which have until recently been regarded as residents, that we may here observe it has been found with, perhaps, the exception of House Sparrows, Green Woodpeckers, Tree Creepers, and Nuthatches,—all the birds not dependent upon man are more or less migratory; and of those species which are said to receive an accession to their numbers in autumn, it ought perhaps more correctly to be stated, that the major part of them move south in autumn, their place being supplied by others of the same species from over the sea,

* In the ten years ending 1820, wheat averaged 87s. per quarter, from which price it has been steadily declining to 51s. for the decade ending 1880, and in 1885 to 32s. 10d., with a still falling market. Should such unremunerative prices continue, it seems probable that much of the poor land brought under the plough in those times of high prices will soon revert to sheepwalk and warren.

or from a more northerly locality. We have, so far as we are able, endeavoured to distinguish between these different forms of migration in the remarks on each species.

In no part of England is the great autumnal movement more observable than on the east coast, from the Tees to the Thames. In Norfolk this vast army is heralded by arrivals in September of Redstarts, Wheatears, Pied Flycatchers, Whitethroats, Nightjars, Little Stints, Pigmy Curlews, etc.; but when October sets in, the greatest influx takes place. A great movement of birds then presents itself, on the coast especially. Buzzards, and other birds of prey, soar aloft in circles, while the eye which knows her flight will catch the distant Peregrine Falcon, or more frequently, the Kestrel or Merlin. Short-eared Owls are discovered in flocks of fifteen or twenty; and the gamekeeper, going his morning rounds, finds that long before he was up there had been an early arrival of Jays and Sparrow Hawks. Straggling parties of Grey Crows, Jackdaws, and Rooks, dot the air for days together, while Snow Buntings, and flocks of Chaffinches, appear in the fields nearest to the sea. Bramblings, Twites, Siskins, Shorelarks, and Mealy Redpolls are heard of at our birdcatchers'. Snipes and Plovers are seen on the marshes. Skylarks come over in clouds, and, mingled with them, are regiments of Starlings, flying westward with steady purpose. The Woodcock, tired with the long flight from Norway, halts to rest after his nocturnal journey in the first plantation he reaches, or drops among the sand-hills. The Fieldfare and Redwing appear, and the number of Song Thrushes and Blackbirds in turnip-fields near the coast is often perfectly amazing. But when November draws to a close, the rush of land-birds is over, though a few small flocks of Grey Crows, Woodcocks, and Larks come dropping in for many weeks afterwards.

As might be expected, many rarities have been met with on the Norfolk coast, and the following rare stragglers were all first obtained in this county:—Black-bellied Dipper, Savi's Warbler, Wall Creeper, Shorelark, Roller, Bee-eater, Red-footed Falcon, Pallas's Sandgrouse, Pectoral Sandpiper, Broad-billed Sandpiper, (?) Eastern Golden Plover, White-winged Tern, Caspian Tern, Capped Petrel, Dusky Petrel, Red-crested Pochard, Buffle-headed Duck, Steller's Duck.

It remains for us to explain why, during the life-time of

Mr. Stevenson, who has so long been the recognised recorder for the county of Norfolk, it has fallen to our lot to compile the list which follows, and in doing so we can only repeat our sincere regret, that the same cause—periodical and prolonged attacks of neuralgia rendering continuous literary work impossible—which has hitherto prevented the completion of his 'Birds of Norfolk' has in like manner prevented his complying with the urgent request of our Committee for a contribution to the Fauna and Flora of Norfolk, long overdue. Our indebtedness to Mr. Stevenson's work and the long series of notes he has contributed to the 'Zoologist' and elsewhere, can only be expressed in general terms; but the extensive series of records open to us, dating back over so long a period, has enabled us to speak with confidence with regard to many species, the excessive rarity of which renders observation a matter of great difficulty.

We have thought it best to follow, both in arrangement and nomenclature, the fourth edition of Yarrell, which must long, and deservedly so, remain the popular handbook of British Ornithology. Those species which have a fully recognised claim to the Norfolk list are numbered progressively; whilst those whose claim is open to objection from any cause are enclosed in square brackets and numbered in a separate series. Some further reference to these species will be made in a summary at the end of the list. For the notes initialed G. and S. respectively, the author whose initial is appended is alone responsible.

1. Golden Eagle (*Aquila chrysaetus*).

The only authentic record of the occurrence of this species in Norfolk is that of one found dead in a marsh at Stiffkey, by Mr. T. J. Mann, in November, 1868. Unfortunately the carcase was too much decomposed to admit of preservation; but both feet and tarsi, as well as the sternum, were secured by Mr. Mann, rendering the determination of the species perfectly satisfactory. Scarcely a year passes without the reported occurrence of a "Golden Eagle" in Norfolk or Suffolk; but upon investigation each has invariably proved to be an immature White-tailed Eagle.—S.

2. White-tailed Eagle (*Haliætus albicilla*).

An autumn and winter migrant. It has not been met with in this county in adult plumage.

3. Osprey (*Pandion haliœetus*).

Not of rare occurrence as a spring and autumn migrant.

4. Greenland Falcon * (*Falco candicans*).

The Norwich Museum contains a very fine adult Greenland Falcon, shot near Cromer in February, 1848. There is an earlier Norfolk specimen in the Saffron Walden Museum, which was killed near Lynn.

5. Peregrine Falcon (*Falco peregrinus*).

Not by any means uncommon as a passage-hawk in this county. Adults have occurred much more frequently than is the case with any other bird of prey which does not breed with us.

6. Hobby (*Falco subbuteo*).

A summer visitant, not infrequently breeding. It has occurred once as early as February (*auct.* W. R. Fisher), and four times in March (*auct.* H. Stevenson, F. Norgate, G. R. Twinn).†—G.

7. Red-footed Falcon (*Falco vespertinus*).

Not known as a British bird until 1830, when no less than five were killed in Norfolk. A sixth occurred in 1843, and a seventh in 1868.

8. Merlin (*Falco æsalon*).

A rather common autumn visitant, generally in immature plumage: in adult plumage it is extremely rare. Mr. Stevenson records a Merlin at Cromer as late in the spring as May 25th ('Zoologist,' 1867, p. 872).

* Gyrfalcon (*Falco gyrfalco*). A young bird, killed on Thetford warren in the spring of 1883, is in the possession of Dr. Churchill Babington. It has been examined by Professor Newton, who thinks it is more like this species than the closely allied Iceland Falcon, but in immature plumage they are almost indistinguishable. H.H. The Maharajah Duleep Singh some years ago kept Gyrfalcons for hawking at Elveden near Thetford, but the head-keeper, Mr. Mayes, informs us that the bird was not lost from there. Unfortunately the warren is just beyond the Norfolk boundary.

† In Sterland and Whitaker's 'Birds of Nottinghamshire,' four Hobbies are entered as having been killed in mid-winter and two in March (p. 67). In Suffolk one has occurred in December and one in January (Babington, 'Birds of Suffolk,' p. 27). It has also been observed in Cumberland in November (Macpherson, 'Birds of Cumberland,' p. 79).—G.

9. Kestrel (*Falco tinnunculus*).

Common, receiving migratory additions to their numbers, particularly in autumn, when the home-bred Kestrels go south.

10. Goshawk (*Astur palumbarius*).

One of the rarest of the Falcon tribe with us. Of thirteen recorded examples, only one is known to have been in adult plumage.

11. Sparrow Hawk (*Accipiter nisus*).

Fairly common, receiving migratory additions to its numbers in the autumn, when those which have bred with us go south.

12. Kite (*Milvus ictinus*).

The Kite was formerly a resident; at what date it ceased to nest with us is not precisely known,—perhaps about 1840,—but some time before it became extinct in Lincolnshire and Huntingdon. Migrants have come to us rather frequently of late years, presumably from Norway.

13. Common Buzzard (*Buteo vulgaris*).

Visits us regularly in spring and autumn, almost always in immature plumage. We know of no evidence of its having nested in this county in the last fifty years.

14. Rough-legged Buzzard (*Buteo lagopus*).

Visits us in autumn, sometimes in considerable numbers, remaining through the winter if not destroyed. Very rare in adult plumage.

15. Honey-Buzzard (*Pernis apivorus*).

An uncertain autumn migrant, sometimes occurring in considerable numbers, but rarely in adult plumage. The last migration of importance was in September, 1881.

16. Marsh-Harrier (*Circus æruginosus*).

Early in the century the "Moor Buzzard" might, according to Lubbock, have been termed "the Norfolk Hawk," it was so generally dispersed amongst the Broads. At the present time a pair or two generally attempt to breed each year somewhere in the Broad district, where they may frequently be seen. Their courage at that season is remarkable, young domestic Ducks

being occasionally seized close to the cottage of their owner; Sir Thomas Browne asserts that even the young of the Otter was sometimes found in their nests.—S.

17. Hen-Harrier (*Circus cyaneus*).

The Hen-Harrier is not at all rare in Norfolk as a migrant, though old grey males have always been considered scarce. It certainly is not as partial to the Broad district as Montagu's Harrier; the last nest said to have been taken, was at Hickling, in July, 1870 ('Zoologist,' 1870, p. 2365), but from enquiries we have made there is great reason for thinking it was a Montagu's Harrier.

18. Montagu's Harrier (*Circus cineraceus*).

More frequently met with than either of the above species; scarcely a year passes without one or more nests being found; but it is probable that few birds escape alive, and still fewer succeed in rearing a brood.—S.

19. Tawny Owl (*Strix aluco*).

This species is generally distributed, but is now becoming very rare, in comparison with what it formerly was.

20. Tengmalm's Owl (*Nyctala tengmalmi*).

A Tengmalm's Owl was caught at Beachamwell in January, 1849; another was killed at Burlingham in April, 1857; and a third was caught alive at Cromer lighthouse in October, 1881.

21. Long-eared Owl (*Asio otus*).

A resident, commonest in autumn, at which season our home-bred birds go south, and their place appears to be supplied by others. Professor Newton believes that the adults are resident (Newton *in litt.*).—G.

22. Short-eared Owl (*Asio accipitrinus*).

This species formerly nested in some numbers in various suitable localities in this county. In June, 1829, Mr. Robert Rising records, in one of his manuscript notes, that several nests were found at Horsey, and twenty-eight of the birds killed by the gamekeepers. For a time it seemed to have deserted us in the breeding season; but of late years it has again appeared in some of its old haunts,

and a nest or two are found almost every year. As an autumn migrant it sometimes makes its appearance in considerable numbers.—S.

23. Scops Owl* (*Scops giu*).

Norfolk is credited with six occurrences,—two at Yarmouth, one at Brundall, one at Bradeston, one at Strumpshaw, and one at Norwich. The last is not to be trusted; and it is more than likely that the so-called "occurrences" at Brundall, Bradestone, and Strumpshaw, all refer to the same bird, these parishes adjoining one another, or one of them may be confused with a Little Owl killed at Blofield. The only example obtained in the last fifty-eight years, and indeed the only one which can be implicitly relied on, was picked up by a boy, in November, 1861, on the road which runs beneath the lighthouse at Cromer.—G.

24. Little Owl (*Carine noctua*).

Messrs. Paget's note is: "Very rare—two specimens are well authenticated" (Nat. Hist. of Yarmouth, p. 4). One of these was probably the Blofield bird obtained in July, 1824 ('Birds of Norfolk,' vol. i. p. 59.) In 1846 a female was taken alive at Costessey. In February, 1862, a male, caught at sea, was brought alive into Yarmouth. In July, 1876, six were liberated at Kimberley (Lubbock's Fauna, ed. ii. p. 46, *note*): that obtained at Haverland in 1877, and a second at Yarmouth by Mr. G. Smith, may possibly have been two of these.—G.

25. Snowy Owl (*Nyctea scandiaca*).

Nine instances of the occurrence of this species in Norfolk are on record, all, of course, in the winter months. That obtained at Felbrigg in 1814 was the first killed in England, and is now preserved in the Museum at Liverpool.

26. Barn Owl (*Aluco flammeus*).

This species doubtless receives a slight accession to its numbers by autumn migrants. Fulvous Barn Owls occasionally occur, of which our Museum contains a very dark and rich example, killed near Norwich, in December, 1864.

* The American Mottled Owl has been admitted into the Norfolk list ('Birds of Norfolk,' vol. i. p. 44), but was omitted by Mr. Stevenson in his last list in White's 'Norfolk' as of doubtful authenticity.

27. Great Grey Shrike (*Lanius excubitor*).

Occasional visitors, generally in the autumn. There is only one record of its occurrence in summer, and that rather a doubtful one, namely at Diss many years ago ('Zoologist,' 1846, p. 1305).

[1. Pallas's Grey Shrike (*Lanius major*).

Whether this variety, distinguished by a single alar bar, be worthy of specific distinction, or not, it is entitled to a place in the Norfolk list as a frequent visitor during autumn and winter.]

28. Lesser Grey Shrike (*Lanius minor*).

This rarity occurred at Yarmouth in the spring of 1869, and again in the spring of 1875. There are only two other recorded British specimens.

29. Red-backed Shrike (*Lanius collurio*).

A summer migrant, not so numerous as in the days of the good old "bullfinch" hedgerows.

30. Woodchat (*Lanius auriculatus*).

A Woodchat was killed at Beechamwell by Mr. John Scales prior to 1829: this was the first occurrence in Norfolk. A second was seen (but not shot) by the Rev. R. Hamond, some time before 1833, at Swaffham (Selby, 'British Ornithology,' vol. i. p. 153). A third was shot at Yarmouth in April, 1859, and a fourth at the same place in May, 1885. It has occurred several times in Suffolk, once as near to our boundary as Gorleston (Yarrell, 'British Birds,' ed. i. vol. i. p. 161).—G.

31. Spotted Flycatcher (*Muscicapa grisola*).

A common summer visitant, though late to arrive.

32. Pied Flycatcher (*Muscicapa atricapilla*).

A somewhat rare spring and autumn visitant, believed to have remained to nest occasionally; but the eggs of the Spotted Flycatcher occasionally resemble those of this species, for which they may have been mistaken.

33. Golden Oriole (*Oriolus galbula*).

One of our rarest summer visitors. In 1850, according to Mr. E. T. Booth, it nested near Norwich. Mr. Booth saw the

nest, which was in a garden, and obtained an egg, which, however, is no longer in existence.* There is reason to suppose that it has also nested at Ormesby. The eggs in the collection of the late Mr. Scales, said to have been taken at Beechamwell, were taken by himself in Holland, as that gentleman informed Professor Newton.

34. Dipper (*Cinclus aquaticus*).

A well-marked specimen of the Common Dipper, or Water Ouzel, in the collection of the Rev. C. J. Lucas, was shot on Breydon Wall in 1849. This, and one killed at Hellesdon, now in the Norwich Museum, are the only occurrences of the English Dipper in Norfolk which are free from doubt.

35. Black-bellied Dipper (*Cinclus melanogaster*).

An occasional, almost an annual, visitant from Scandinavia; generally occurring in November.

36. White's Thrush (*Turdus varius*).

A male of this beautiful Asiatic straggler, now in the Rev. S. Micklethwait's collection, was killed on the 10th October, 1871, by Mr. F. Borrett, at Hickling.

37. Mistletoe Thrush (*Turdus viscivorus*).

A common resident. There can hardly be a doubt that this species receives a large accession to its numbers in the autumn by arrivals from the North of Europe, most of which go further south should the weather be severe, but in no case has Mr. Gurney received its wings from the keepers of the light-ships round the coast. Mr. Booth, however, received two wings from the Lynn Well light, which had been taken in the latter part of the winter of 1882.—S.

38. Song Thrush (*Turdus musicus*).

Common, and generally distributed in the summer months. In October and November this species receives immense additions to its numbers by foreign arrivals, and whilst Partridge shooting along the coast in that month, Mr. Gurney has been perfectly amazed at the numbers found in the turnips. It is probable that a portion of

* 'Catalogue of the Dyke Road Museum at Brighton,' by E. T. Booth (p. 141). Mr. Booth's fine collection at Brighton contains many Norfolk rarities.

the home-bred birds have already left us before these large arrivals take place; but in November and the beginning of December these also retreat from the coast, and move south, or seek more sheltered localities. Certainly in the gardens of Norwich, and probably in most inland towns, both the Blackbird and the Thrush are almost as numerous in winter as at any other season. In February and March the return movement commences, and they are again seen in the grass-fields; but the northward migration in spring, which passes over Norfolk, and leaves some of its number behind, is as nothing compared with the great wave which passes over us in the month of October.—S.

39. Redwing (*Turdus iliacus*).

40. Fieldfare (*Turdus pilaris*).

Both these species are winter visitants, more or less numerous according to the severity of the season.

41. Blackbird (*Turdus merula*).

This species, like the Thrush, receives large accessions to its numbers in the autumn, which however generally appear to pass on, as do a portion of the home-bred birds. It does not seem to desert the open country to such an extent as the Thrush does.

42. Ring Ouzel (*Turdus torquatus*).

Mr. Stevenson ('Birds of Norfolk,' vol. i. p. 84) speaks of the Ring Ouzel as a regular spring and autumn migrant, occasionally known to nest. In 1861 a Ring Ouzel was seen on its nest by Mr. W. Clarke at Ashwicken near Lynn ('Field,' Oct. 26th, 1867).—G. A note in the late Mr. Robert Rising's copy of Yarrell's 'British Birds' says that a nest was found in a cottage garden at Horsey in May, 1855, containing four eggs, and that a second nest was found in the same locality subsequently. A Blackbird with a white gorget, singularly like a Ring Ouzel, frequented the garden of one of the authors last summer, and might very readily have been mistaken for one of the latter birds.—S.

43. Hedge Sparrow (*Accentor modularis*).

Common, especially near human habitations. This is one of the few species which does not seem to vary in numbers according to seasons.—S.

44. Redbreast (*Erithacus rubecula*).

Common; receiving migratory additions in the autumn.

45. Nightingale (*Daulias luscinia*).

A summer migrant; frequent in the neighbourhood of Norwich and Lynn. At Cromer and Yarmouth comparatively rare.

46. Red-spotted Bluethroat (*Ruticilla succica*).

Occurred at Yarmouth in September, 1841, at Cley in September, 1881, and again at Yarmouth and Cley in September, 1883. On the last occasion nine were obtained at Cley by Mr. F. D. Power. In September, 1884, Mr. Power and his brother saw at least eighty of these birds in the same locality; but in September, 1885, not one was seen, though one was shot at Horsey. The observations of these gentlemen on the migration of this species (Trans. Norfolk and Norwich Nat. Soc. vol iv. p. 36) should be read.

47. Redstart (*Ruticilla phœnicurus*).

A summer visitant. Numbers of young Redstarts generally pass along the coast during the first week in September. In 1880 we had an unusual migration of them on the last three days of August.

48. Black Redstart (*Ruticilla titys*).

Has occurred ten times, and eight of these occurrences have been on the coast. It may be almost looked for as an annual winter visitant.—G.

49. Stonechat (*Saxicola rubicola*).

Common in suitable localities.

50. Whinchat (*Saxicola rubetra*).

A summer visitant, fairly common. It comes to Cley and Blakeney with other small land birds in the September migration.

51. Wheatear (*Saxicola œnanthe*).

Not very common on the eastern side of the county, except during migration, which takes place about the 1st of September, when an influx sometimes arrives, and follows the coast line south. In the open districts of West Norfolk it is much more frequent.

52. Icterine Warbler (*Hypolais icterina*).

This addition to the Norfolk Fauna was obtained by Mr. F. D. Power at Blakeney, September 11th, 1884. Full particulars of the occurrence are given in our 'Transactions' (vol. iv. p. 36 *et seq.*).

53. Reed Warbler (*Acrocephalus streperus*).

A summer visitant, generally distributed, very abundant on the broads in most seasons, but rather uncertain.—S.

54. Sedge Warbler (*Acrocephalus schœnobœnus*).

A common summer visitant, dispersed throughout the county wherever suitable cover is found near a stream or wet carr.

[2. Aquatic Warbler (*Acrocephalus aquaticus*).

This species is figured in Hunt's 'British Birds' for the Sedge Warbler, possibly from a Norfolk specimen, but no letterpress accompanies the plate.]

55. Grasshopper Warbler (*Acrocephalus nævius*).

A summer visitant, but by no means numerous.

56. Savi's Warbler (*Acrocephalus luscinioides*).

Six of these birds, including the first and last met with in England, have been killed within a radius of about as many miles in the Broad district. Four of them are now in the Norwich Museum. A nest was obtained by the late Mr. Newcome from the neighbourhood of Yarmouth (Yarrell, 'British Birds,' ed. iv. vol. i. p. 393; 'Birds of Norfolk,' vol. i. p. 113).

57. Dartford Warbler (*Melizophilus undatus*).

The Dartford Warbler is met with on the borders of Norfolk and Suffolk. Hunt speaks of two near Beccles in June, 1828, and two others have occurred on Yarmouth Denes.

58. Whitethroat (*Sylvia rufa*).

A very abundant summer visitant.

59. Lesser Whitethroat (*Sylvia curruca*).

Also a summer migrant, but very local and scarce compared with the preceding.

60. Barred Warbler (*Sylvia nisoria*).

A young female of the Barred Warbler was shot by Mr. F. D. Power, about half a mile east of Blakeney Point, on the 4th of September, 1884. Two others occurred during the same autumn, one in Yorkshire, and the other on the west coast of Scotland.

61. Garden Warbler (*Sylvia hortensis*).

A summer migrant, not quite so frequent as the Blackcap, and more local.

62. Blackcap (*Sylvia atricapilla*).

A summer migrant, rather common.

63. Wood Wren (*Phylloscopus sibilatrix*).

A summer visitant, but local.

64. Willow Wren (*Phylloscopus trochilus*).

A summer visitant. Extremely common, especially at the periods of migration.

65. Chiffchaff (*Phylloscopus collybita*).

A summer visitant, but somewhat local.

66. Golden-crested Wren (*Regulus cristatus*).

Generally distributed in the summer. In the autumn the Goldcrest receives enormous additions to its numbers, a portion of which, as well as the resident adults, do not appear to go further south, but it is probable that most, or all, of our home-bred birds leave us in October.

67. Fire-crested Wren (*Regulus ignicapillus*).

Male Goldcrests are frequently mistaken for this species, which has only been known with certainty to have occurred twice in Norfolk, viz., at Yarmouth in November, 1843, and at Attlebridge in November, 1879. Mr. Lubbock speaks of one which "year after year occupied the same position in a birdstuffer's window" in Norwich, implying that it was a local specimen.

68. Wren (*Troglodytes parvulus*).

A common resident, receiving slight additions in autumn from over the sea.

69. Tree Creeper (*Certhia familiaris*).

A common and generally distributed resident.

70. Wall Creeper (*Tichodroma muraria*).

To the discovery of the interesting series of letters from Gilbert White to Robert Marsham, which the Rev. H. P. Marsham of Rippon Hall entrusted to one of the authors for the use of the Norfolk and Norwich Naturalists' Society, we owe the knowledge of a very curious fact, viz., the occurrence of the Wall Creeper at Stratton Strawless, on October 30th, 1792. White died less than eight months after Marsham had made him acquainted with the event, which accounts for his not having brought so interesting an occurrence to the notice of ornithologists. The entire correspondence of both naturalists, with other particulars referring to the bird, will be found in our 'Transactions' (vol. ii. p. 178 *et seq.*). A second specimen was shot in Lancashire in May, 1872 (Mitchell's 'Birds of Lancashire,' p. 56). Mr. H. Saunders tells us he has seen several which were obtained at Nantes in the north of France (Yarrell's 'British Birds,' vol. iii. p. 9); it also occurs in Belgium (Dubois, 'Revue des Oiseaux en Belgique,' p. 6). There is therefore nothing to excite surprise in its occasionally straying to our shores.—G.

71. Great Titmouse (*Parus major*).

Universally distributed. Their occasional occurrence at our light-vessels proves them to be migratory. That this was the case was long ago suspected (*cf.* 'Zoologist,' 1848, p. 2071).

72. Blue Titmouse* (*Parus cæruleus*).

Universally distributed. Its numbers certainly vary, and as it is said to have been taken on the Cockle light-vessel, it is probably migratory.

73. Coal Titmouse (*Parus britannicus*).

A common resident, differing from *Parus ater* only in the greener shade of its back.

* In Babington's 'Birds of Suffolk' it is stated (p. 63) that a Crested Titmouse (*Parus cristatus*) was seen, but not obtained, by the late Mr. Spalding, at Ditchingham in Norfolk. It is a likely bird to occur on our east coast with other Norwegian migrants (*cf.* Gray's 'Birds of Scotland,' p. 104).—G.

[3. European Coal Titmouse (*P. ater*).

Whether or not the Scandinavian form of the Coal Titmouse, differentiated by Messrs. Sharpe and Dresser, which also inhabits the ancient pine forests of Scotland (*fide* Yarrell, 'British Birds,' ed. iv. vol. i. p. 492), be entitled to specific distinction, these gentlemen have decided that at least two Norfolk-killed Coal Titmice belong to this form, distinguished by having bluish backs; but it is evidently uncommon, for a sharp lookout has not resulted in the recognition of any additional examples.]

74. Marsh Titmouse (*Parus palustris*).

Common and generally distributed, being in no sense of the word a marsh bird.

75. Long-tailed Titmouse (*Acredula caudata*).

A common and generally distributed resident.

76. Bearded Titmouse (*Panurus biarmicus*).

Our Broads are the last breeding-place in Great Britain of the Bearded Titmouse. Occasional flocks still visit Cley and Salthouse, though there is now little more than the memory of their old marshes left: in former days every reed-bed of any extent along the coast of Norfolk and Suffolk was tenanted by this lovely bird.

77. Waxwing (*Ampelis garrulus*).

An accidental winter visitant, occasionally coming in large numbers: the last visitation was in the winter of 1866–67. Mr. Stevenson's interesting paper on the plumage of a large series obtained then will be found in our 'Transactions' (vol. iii. p. 326).

78. Pied Wagtail* (*Motacilla lugubris*).

Very few are found in winter, but at other times of the year it is common, and may be said to be the first to return of the regular spring migrants.

* White Wagtail (*Motacilla alba*). The White Wagtail, though often looked for, has never been *obtained* in Norfolk, but as it is an annual summer visitant to England it must surely visit us. In spring, this species may be best known by its light grey back, which grey is continued to the root of the tail; but at other seasons it is extremely difficult to distinguish from the Pied Wagtail. Mr. Upcher thinks that he identified a pair at Feltwell in September, 1883 (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 578).

79. Grey Wagtail (*Motacilla sulphurea*).

The Grey Wagtail is most often met with in the autumn, but Mr. Stevenson has a good specimen in breeding plumage, shot at Boyland. It is decidedly rare about Cromer and in the Broad district, but is more frequent in some parts of Norfolk, particularly on the river at Norwich and Carrow. At Heigham and at Keswick several were observed in January, 1870 ('Zoologist,' 1870, p. 2362).—G.

80. Grey-headed Wagtail (*Motacilla flava*).

As a summer, or rather as a spring, visitant, this species has been shot in about five instances, and Mr. E. T. Booth mentions watching some on the edge of Breydon Broad.

[4. Grey-capped Wagtail (*Motacilla cinereicapilla*).

The Grey-capped Wagtail is included in this list on the authority of a specimen in my father's collection, said to have been killed at Sheringham in 1842 (Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 226). He believes he bought it of the late Mr. Sayer the birdstuffer, who is always considered to have been a very truthful man, and the bird certainly has the appearance of having been mounted from the flesh. It exactly resembles Gould's figure of one killed in Cornwall ('Birds of Great Britain,' vol. iii. plate v.), which circumstance led to its identification.—G.]

81. Yellow Wagtail (*Motacilla raii*).

A summer migrant, generally distributed; affecting low-lying or marshy localities.

82. Tree Pipit (*Anthus trivialis*).

A summer migrant, common in wooded districts, where it takes the place of the next species.

83. Meadow Pipit (*Anthus pratensis*).

Common, receiving additions in autumn.

84. Rock Pipit (*Anthus obscurus*).

Confined to the coast. The Rock Pipit is frequently shot or netted at Yarmouth. Mr. F. D. Power suspects it of having nested in 1880 at Blakeney (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 346), where it is sometimes very abundant in the autumn (*cf.* 'Zoologist,' 1885, p. 173).

[5. Scandinavian Rock Pipit (*Anthus rupestris*).

By many considered to be only a rufous-breasted form of the Rock Pipit. Two occurred to Mr. Stevenson near Norwich in March, 1864, and one to Mr. Booth at Horsey in March, 1871.]

85. Richard's Pipit (*Anthus richardi*).

Has been taken six times; four of these occurrences have been in the winter, and two in the spring, and all near Yarmouth.

86. Shorelark (*Otocorys alpestris*).

The Shorelark is now found to be not at all uncommon. It is a winter visitant, and always occurs on the coast. Mr. Gätke tells me it is much commoner now than it used to be in Heligoland, and he thinks it is spreading westwards, which would account for its abundance in Norfolk.—G.

87. Skylark (*Alauda arvensis*).

A very common resident, and yet, at the same time, there is not a more migratory bird. It outnumbers any other species during the passage in October and November, and at that time is the commonest bird in the county.

88. Woodlark (*Alauda arborea*).

The Woodlark as a summer visitant is not uncommon about Brandon, Thetford, and Harling. Mr. Stevenson mentions the occurrence of migrants on two occasions in winter ('Birds of Norfolk,' vol. i. p. 180), at which season it has since been frequently obtained on Yarmouth Denes, and generally in hard weather, but Mr. Stevenson records one as early as the 5th of October in the same locality (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 552).—G.

89. Snow Bunting (*Plectrophanes nivalis*).

To be found in winter all along the coast: most frequent at Yarmouth, Blakeney, and on the shores of the Wash.

90. Lapland Bunting (*Plectrophanes lapponicus*).

Has occurred five times; three out of the five (all males) were taken alive in nets, the other two were shot at Cley (Trans. Norfolk and Norwich Nat. Soc. 1871-72, p. 65, and vol. iv. p. 42). It is probable that this bird will hereafter prove to be an annual visitant.

91. Reed Bunting (*Emberiza schœniclus*).

A resident, and common in suitable localities. A single wing received from the "Leman and Ower" light-vessel shows it to be migratory.

92. Bunting (*Emberiza miliaria*).

This bird is resident and tolerably abundant, particularly in March, when a migratory movement takes place.

93. Yellow Hammer (*Emberiza citrinella*).

Very common everywhere.

94. Cirl Bunting (*Emberiza cirlus*).

Two undoubted specimens of this bird were obtained at Hickling in the autumn of 1875 by Mr. E. T. Booth; others are said to have occurred in 1849 and 1855, but the records are not so satisfactory as could be wished.

95. Ortolan Bunting (*Emberiza hortulana*).

An immature male was shot by Mr. F. D. Power from among some Linnets at Cley, September 12th, 1884 (Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 40). Enormous numbers were seen on Heligoland the same week (Sixth Report on Migration, p. 51). Previous occurrences in Norfolk are all very questionable.

96. Chaffinch (*Fringilla cœlebs*).

A very abundant resident: it is also one of the commonest species taken on migration at our floating light-ships.

97. Brambling (*Fringilla montifringilla*).

A winter visitant, varying very much in abundance. In the winter of 1885–86 they were very numerous, not only in Norfolk, but in many other parts of England. There is a variety of this bird which has a black chin: it has been obtained five or six times in Norfolk; but a still rarer variety with a white chin, like a cheveril Goldfinch, was lately killed at Yarmouth.—G.

98. Tree Sparrow (*Passer montanus*).

This species, formerly regarded as rare and extremely local, has proved to be more generally distributed than was thought to be the case. In summer small colonies affect pollard trees (generally in the neighbourhood of water), in holes, in which they make their nests; but occasionally a domed nest is constructed in the

deserted home of some other species, and it has been known to breed under the tiles of a roof far from any water (*cf.* 'Zoologist,' 1885, p. 67). There can be no doubt a partial migration takes place in autumn, and that the home-bred birds at that season receive a large accession to their numbers from abroad.—S.

99. House Sparrow (*Passer domesticus*).

All too common everywhere. The utility of the Sparrow has been the subject of two long discussions before our Chamber of Agriculture, when the bird was voted to be a pest by a large majority of those present; and a concerted movement for their destruction has been started by Mr. Buxton among the farmers at Aylsham.—G.

100. Hawfinch (*Coccothraustes vulgaris*).

Much commoner, or more observed, than formerly; though very shy, and difficult of detection.

101. Greenfinch (*Coccothraustes chloris*).

Common everywhere. Mr. E. T. Booth has had twenty-one of these birds from light-vessels ('Catalogue of Birds,' p. 138), which shows them to be highly migratory; yet, among the many wings which I have received, this species has never been represented.—G.

102. Serin Finch (*Serinus hortulanus*).

A male Serin was shot at Yarmouth on June 13th, 1885, which, in the opinion of Mr. Edward Bidwell and Mr. R. W. Chase, into whose possession it has passed, shows no sign of having escaped from confinement.*

103. Goldfinch (*Carduelis elegans*).

Believed to have been formerly a much more abundant species: the enormous numbers taken in clap-nets in Sussex is quite enough to account for this decrease (*cf.* Yarrell, 'British Birds,' ed. iv. vol. ii. p. 118) in Norfolk and other counties further north, though much is also due to the advance of cultivation, the enclosure of waste lands, and keeping hedges, banks, etc., freer from weeds.—G.

* The Rev. H. A. Macpherson informs us that in April, 1877, he bought a pair of these birds of a London birdcatcher, which were said to have been recently caught at Yarmouth. The male died at once, and the female was so wild that after a few weeks she was suffered to fly away (*cf.* 'Zoologist,' 1885, p. 68).

104. Siskin (*Carduelis spinus*).

A regular autumn visitant, but in uncertain numbers, arriving towards the end of September and usually departing in January; but a few stragglers are often seen much later.—S.

105. Mealy Redpoll (*Linota linaria*).

A winter visitant, occasionally quite abundant, but very uncertain as to numbers.

106. Lesser Redpoll (*Linota rufescens*).

A resident, generally dispersed throughout the county, but as a rule not a numerous species. Mr. F. Norgate informs us that he has found thirty nests in one season at or close to Sparham, but this must have been an exceptional season. In autumn we are visited by flocks varying considerably in number, but occasionally they are quite numerous.

107. Linnet (*Linota linaria*).

Common, receiving migratory additions in the autumn, but these do not stay long. The home-bred birds seem to disappear entirely in mid-winter. Hybrids between the Linnet and Greenfinch have occurred at least three times in a wild state, the last of which, obtained at Yarmouth, has not been before recorded.

108. Twite (*Linota flavirostris*).

A regular winter visitant, but in varying numbers.

109. Bullfinch (*Pyrrhula europœa*).

Not uncommon in some parts of the county, but rather local. Tolerably abundant about Cromer.

110. Crossbill (*Loxia curvirostra*).

An uncertain visitant, more especially in the northern and eastern parts of the county, where the Silver takes the place of the Scotch Fir. It bred near Downham, just over our Suffolk border, in 1885, and a gamekeeper named Eagle told Mr. F. Norgate that it nested near Lyndford some years ago; but a supposed nest at Sheringham many years ago (Mag. Nat. Hist. vol. iii. p. 156; Trans. Norfolk and Norwich Nat. Soc. vol ii. pp. 19, 22) is doubtful. None have been seen in the Cromer district since 1869, when one or two flocks appeared in the spring.

111. Parrot Crossbill* (*Loxia pityopsittacus*).

Professor Newton has recorded a red male shot at Riddlesworth, some years prior to 1851 ('Zoologist,' 1851, p. 3145), the only Norfolk specimen known.

[6. Red-winged Starling (*Agelæus phœniceus*).

A Red-winged Starling—the second British specimen—was shot on Barton Broad in June, 1843. It is not an uncommon cage-bird, but there is no reason why it should not have crossed the Atlantic.]

112. Starling (*Sturnus vulgaris*).

A very common resident, in addition to which enormous numbers of migrants come to us in autumn. Seven hundred and twenty-four Starlings and Larks are said to have been caught in a single night at Cromer lighthouse ('Zoologist,' 1875, p. 4366). Many fly against our floating light-vessels. On October 24th, 1884, the Principal of the "Leman and Ower" reckoned that five thousand passed his vessel (Sixth Report on Migration, p. 53). Many other instances might be given. In Heligoland the Starling is looked upon as one of the most numerous of migrants (*l.c.*), "immense numbers" and "astounding flights" being recorded as passing.—G.

113. Rose-coloured Pastor (*Pastor roseus*).

A Rose-coloured Pastor was shot as long ago as 1747 at Rougham, as recorded by G. Edwards (Nat. Hist. of Birds, vol. iv. p. 222). Since that time many others have been recorded chiefly near the coast (*cf.* Stevenson, 'Birds of Norfolk,' vol. ii. p. 253), including some fine males with splendid crests, but of late years only two have been shot in Norfolk.

114. Raven (*Corvus corax*).

Quite extinct as a resident; the last nests were at Shadwell, Ickburgh, Beachamwell, and Melton. A pair used to nest on the ruined steeple at South Walsham; another pair nested as near to Norwich as the "Violet Grove" at Earlham, when my father was a boy. Stragglers are said to have been seen from time to time on the coast, but no example has been shot for many years.—G.

* The Pine Grosbeak is included in 'The Birds of Norfolk,' but apparently the evidence is not sufficient for retaining it (*cf.* 'Zoologist,' 1877, p. 245).

115. Carrion Crow (*Corvus corone*).

In spite of game-preserving a good many Carrion Crows still exist in Norfolk. In the meadows at Sparham there is a spot from which it is, or was, possible to count twelve nests at once. Interesting observations have been made in this locality by Mr. Norgate (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 68; *et cf.* 'Zoologist,' 1881, p. 330). Round Cromer the bird seems quite extinct, but a pair or two still nest near Holt.—G.

116. Hooded Crow (*Corvus cornix*).

An abundant winter visitant; but it has been frequently seen in summer, and is supposed to have nested near Lynn; and at Sheringham in 1867 ('Zoologist,' 1867, p. 1012). In some years numbers may be observed passing over Northrepps and Overstrand in March, always going in the same direction—south-east.—G.

117. Rook (*Corvus frugilegus*).

A resident, very abundant and increasing. In autumn some come over the sea to us, and it is likely many others visit us from Scotland and the north of England at that season. These are presumedly the same which make our coast a point of departure in March, at which time numbers may often be seen at Cromer going south-east, though why they fly in that direction is not clear. On the 20th of March, 1886, an extraordinary flight was seen at Somerton by Mr. G. Hunt going south. He considers that there could never for one moment of the day have been less than a thousand in sight at one time. I observed similar flights on the same day, though in much smaller numbers, at Northrepps: they were going with the wind, which was north-west. Mr. Smith also saw flocks at Yarmouth; and Mr. J. Cordeaux informs me a like movement was seen at or about the same date at Heligoland and Hanover.—G.

118. Jackdaw (*Corvus monedula*).

A common resident. Some come to us in the autumn, and in March they may sometimes be seen following the line of the coast southwards with Rooks and Crows, though the opposite direction is the one which would be naturally taken at that season.—G.

119. Magpie (*Pica rustica*).

Resident in small numbers, but decidedly rare in the western division of the county. Migrants doubtless come in autumn. It will readily take up its quarters where not persecuted, as I have proved.—G.

120. Jay (*Garrulus glandarius*).

Still a common and generally distributed resident, sometimes receiving migratory additions in autumn.

121. Nutcracker (*Nucifraga caryocatactes*).

One shot at Rollesby, October 30th, 1844; another shot off Yarmouth, October 7th, 1853 ('Zoologist,' 1853, pp. 4096–4124).

122. Swallow (*Hirundo rustica*).

Common in summer.

123. House Martin (*Chelidon urbica*).

Much less numerous than formerly, from persecution by the Sparrows, which in many places are observed to usurp or drive the rightful owners from nearly every nest.

124. Sand Martin (*Cotile riparia*).

Common in summer.

125. Swift (*Cypselus apus*).

A rather numerous summer visitant.

126. Alpine Swift (*Cypselus melba*).

Two have been obtained in this county, one at Old Buckenham, the other at Yarmouth; and two others have been seen.

127. Nightjar (*Caprimulgus europæus*).

A common summer visitant wherever suitable localities are found. Some interesting notes on its nidification, as observed in Norfolk by Mr. F. Norgate, are given in the "Zoologist" for 1884 (p. 88). The two young are seldom of the same size.

128. Cuckoo (*Cuculus canorus*).

A summer visitant, generally distributed. The reddish variety, which has been named *Cuculus hepaticus* or *rufus*, has occurred at Letton and Cantley (*cf.* Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 480).

129. Hoopoe (*Upupa epops*).

A spring and autumn migrant. The Hoopoe has of late become very rare (*cf.* 'Zoologist,' 1875, p. 4633), and no wonder, for those which come seldom or never get the chance of coming again. In April, 1884, I received the head and feet of one from the Hasborough floating light-ship.—G.

130. Roller (*Coracias garrulus*).

Mr. Stevenson enumerates fifteen occurrences of the Roller ('Birds of Norfolk,' vol. i. p. 310). Of late years only two have been met with, one shot at Gresham, June 2nd, 1884, the other at Felthorpe in October, 1885. In no instance have they been met with more than fourteen miles from the coast, and generally much nearer. The reason is not far to seek: their handsome plumage and loud voice speedily draw attention, which as speedily leads to their destruction before they have time to pass inland.—G.

131. Bee-eater (*Merops apiaster*).

The Bee-eater has occurred eight times as recorded by Mr. Stevenson ('Birds of Norfolk,' vol. i. p. 313). One was also seen at Billingford in May, 1880 (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 405).

132. Kingfisher (*Alcedo ispida*).

This species must be largely reinforced by migrants in September, or it could not possibly stand against the persecution to which it is subjected. It may be classed as a resident generally distributed.

133. Green Woodpecker (*Gecinus viridis*).

This again is a sadly persecuted species, but, nevertheless, it seems to hold its ground. We visited a birdstuffer's shop together at Thetford, at which there must have been fifty specimens in different stages of preservation. The Norwich birdstuffers have more brought to them than they know how to dispose of.

134. Greater Spotted Woodpecker (*Dendrocopus major*).

A resident, and breeds in limited numbers. Occasionally a considerable number of these birds migrate hither in autumn, which is never the case with the Green Woodpecker.

135. Lesser Spotted Woodpecker (*Dendrocopus minor*).

Resident with us in small numbers, and apparently more frequent than formerly. A female was picked up on Yarmouth beach many years ago, which is indicative of its being, like the larger species, a migrant.

136. Wryneck (*Iynx torquilla*).

A summer migrant, rather common, yet local. A few are to be met on the coast-line near Cromer, in the beginning of September, on their way south.

137. Ring Dove (*Columba palumbus*).

Breeds throughout the county. The first hard weather drives them south, but in a few days their place is taken by a larger number from Scotland and the north. That some come over the sea is proved—if proof be wanting—by one having been caught on the "Leman and Ower" light-vessel.

138. Stock Dove (*Columba œnas*).

A common, but local bird, always nesting in holes of some kind. Occasionally hard weather brings large migratory additions as late as January and February. The bird is mentioned three times in the Household Accounts of the le Stranges.—G.

139. Turtle Dove (*Turtur communis*).

A summer migrant, very common. Lubbock says it was formerly but an occasional migrant, but already in his time it had become much commoner.

140. Pallas's Sand Grouse (*Syrrhaptes paradoxus*).

The advent of these Tartar Sand Grouse, in 1863, was one of the most extraordinary ornithological events on record, and attracted especial notice in Norfolk, where sixty were obtained; but it did not appear to be generally known that, four years earlier (July, 1859), a single individual had been killed at Walpole St. Peter. Mr. Stevenson has given an admirable account of the irruption ('Birds of Norfolk,' vol. i. p. 376) with a plate by Wolf showing both sexes. None have occurred in England since.

141. Black Grouse (*Tetrao tetrix*).

Black Grouse now only exist at Sandringham, where, although their numbers have been replenished by importations (the first of

which was prior to 1854), there were in 1883 only about nine brace. Six brace were turned out in the autumn of 1885, near Thetford, by Mr. W. D. Mackenzie ('Field,' March 6th, 1886), which we have been informed were pinioned, and therefore would have small chance of surviving.

142. Pheasant (*Phasianus colchicus*).

In such a game-preserving county it is needless to say the semi-domesticated Pheasant abounds, with numerous varieties, and crosses with Asiatic species, and the number killed on a big day on such estates as Holkham, Lyndford, Merton, and Gunton, is prodigious. On these occasions a few females assuming male plumage are generally met with, and are well known to keepers, by whom they are termed "mules": they very rarely assume more than two-thirds of the masculine garb, and have been known to revert to the normal plumage in confinement.

143. Partridge (*Perdix cinerea*).

Extraordinarily abundant considering the annual slaughter which takes place, showing what may be effected by systematic protection in the spring and summer.

144. Red-legged Partridge (*Caccabis rufa*).

Not quite so common as formerly in Norfolk (*cf.* 'Zoologist,' 1883, p. 79), for although it is from Norfolk and Suffolk that it has now spread over a large part of England, it has become thinner at the centre, though much esteemed as a game-bird by some proprietors.—G.

145. Quail (*Coturnix communis*).

The Quail is strictly speaking a spring and autumn visitant, although it nests occasionally in this county. There can be little doubt that its present scarcity is due far more to the captures which annually take place in the south of Europe, than to any agricultural changes in Norfolk. The occurrence of a great number in the summer and autumn of 1870 has been placed on record by Mr. Stevenson, and it may be that this was owing to certain winds having prevented their halting as usual on dangerous ground in Italy and elsewhere when going north in the preceding spring.*—G.

* They were very abundant at the same time in Wales ('Zoologist,' 1870, p. 2394), also in Lincolnshire and Yorkshire.

23 JUIN 1886

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The Treasurer in Account with the Norfolk and Norwich Naturalists' Society, Year ending 28th March, 1887.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from last year	13	1	3	By Fletcher and Son, for Printing *Transactions*, 1885—86	36	18	0
,, Subscriptions :—				,, Stevenson and Co., for Printing	1	18	0
4 for 1885—86 ... ... £1 0 0				,, Goose & Co., for ditto	0	14	6
180 ,, 1886—87 ... ... 45 0 0				,, Insurance	0	3	0
1 ,, 1886—87 ... ... 0 10 0				,, Gratuity to Doorkeeper	0	10	0
4 ,, 1887—88 ... ... 1 0 0				,, Postage, Stationery, and Carriage	5	3	6
1 ,, 1888—89 ... ... 0 5 0				,, Museum Subscription	2	2	0
1 ,, 1889—90 ... ... 0 5 0				,, Assistant-Secretary's Salary	5	0	0
	48	0	0	,, Balance in hand	12	19	3
,, Additional payments for monthly summons	0	11	0				
,, Sale of *Transactions*	1	13	6				
,, Donation, J. H. Gurney, Junr., Esq.	1	5	0				
,, Interest	0	17	6				
	£65	8	3		£65	8	3

LIFE MEMBERSHIP FUND.

	£	s.	d.				
To Balance from last year	62	5	9	By Balance in Post Office Savings Bank	£66	16	5
,, 1 Composition for Membership	3	0	0				
,, Interest	1	10	8				
	£66	16	5				

Norwich, 29th March, 1887.

Examined and found correct,

STEPHEN WM. UTTING, *Auditor.*

List of the Publications received by the Society as Donations or Exchanges from March, 1886, to March, 1887.

BABINGTON (Churchill, D.D.). Catalogue of the Birds of Suffolk; with an Introduction and Remarks on their Distribution. 8vo. Lond. 1884—86. *From the Author*

BAIRD (Spencer F.). Catalogue of North American Birds, chiefly in the Museum of the Smithsonian Institution. 4to. Washington, 1858. *From Lieut.-Col. Feilden, F.G.S.*

BATH Natural History and Antiquarian Field Club. Proceedings, vol. vi. no. 1. 1886. *From the Club*

BELFAST Naturalists' Field Club. Annual Report. Second Series. vol. ii. part 5. 1884—85. *From the Club*

BELGIUM. Annales de la Société Royale Malacologique de Belgique. Tome 20. Année 1885. Royal 8vo. *From the Society*

BENNETT (Arthur, F.L.S.). Additional Records of Plants from Scotland. Since the publication of "Topographical Botany, edition ii." pp. 20. 8vo. Perth, 1886. *From the Author*

BERWICKSHIRE Naturalists' Club. Proceedings, vol. xi. no. 1. 1886. *From the Club*

BIRDS. Report on the Migration of Birds. Seventh Report, 1885. 8vo. Edinb. 1886. *From Mr. J. Cordeaux*

BONAPARTE (Prince Ch.). Tableaux Paralléliques de l'Ordre des Gallinacés. pp. 20. [Extrait de l'Académie des Sciences, tome 42, 1856.] 4to. *From Professor Newton, F.R.S.*

BRIDGMAN (John B., F.L.S.). Further additions to the Rev. T. A. Marshall's Catalogue of British Ichneumonidæ. [From the Transactions of the Entomological Society of London, October, 1886, pp. 335—373.] 8vo. *From the Author*

BRISTOL Naturalists' Society. Proceedings, New Series, vol. v. part i. 1886. *From the Society*

CALIFORNIA Academy of Sciences. Bulletins nos. 4 and 5. 8vo. San Francisco, 1886. *From the Academy*

CARDIFF Naturalists' Society. Report and Transactions, vol. xvii. 1885. *From the Society*

CROYDON Microscopical and Natural History Club. Proceedings and Transactions, Feburary 13th, 1884, to January 13th, 1886. 8vo. Croydon, 1886. *From the Club*

Cumberland and Westmoreland Association for the Advancement of Literature and Science. Transactions, no. 10. 1884–85.
From the Association

Eastbourne Natural History Society. Transactions, New Series, vol. i. parts 9 and 10. 1886. *From the Society*

Edinburgh. Geological Society. Transactions, vol. v. part 2. 1887. *From the Society*

——— Royal Physical Society. Proceedings, vol. ix. part 1. 1886. *From the Society*

Essex Field Club. Transactions, vol. iv. part 2. 8vo. Buckhurst Hill, 1886. *From the Club*

——— The Essex Naturalist: being the Journal of the Essex Field Club. Nos. 1 and 2. 8vo. Buckhurst Hill, 1887.
From the Club

Forster (J. R.). Enchiridion Historiae Naturali inserviens. Sm. 8vo. Halae, 1788. *From Professor Newton, F.R.S.*

Glasgow Natural History Society. Proceedings, New Series, vol. i. part 2. 1884–85. *From the Society*

——— General Index to the First Series, 1851–83.
From the Society

Heathcote (F. G., M.A.). The Early Development of *Julus terrestris*. [From the Quarterly Journal of Microscopical Science, New Series, vol. xxvi. pp. 449–470.] 8vo.
From Professor Newton, F.R.S.

Hertfordshire Natural History Society and Field Club. Transactions, vol. iii. parts 8 and 9; vol. iv. parts 1–4. 1886–87.
From the Society

Lea (Isaac). Description of Six New Species of the Genus Unio. [Read before the American Philosophical Society, November 2nd, 1827.] pp. 15. 4to. *From Professor Newton, F.R.S.*

Liverpool Naturalists' Field Club. Proceedings. 1885–86.
From the Club

London. Geological Society. Quarterly Journal. Nos. 164–167. Nov., 1885–August, 1886. *From Lieut.-Col. Feilden, F.G.S.*

——— Royal Geographical Society. Proceedings, April, 1886, to March, 1887. *From Mr. H. G. Barclay, F.R.G.S.*

——— Royal Microscopical Society. Journal, Second Series, vol. vi. parts 2–6, and 1887, part i. April, 1886–February, 1887.
From the Society

——— Quekett Microscopical Club. Journal, Second Series, vol. ii. nos. 15, 16, and 17. May, 1886–January, 1887.
From the Club

London. Linnean Society. Transactions, Second Series: *Zoology*. Vol. ii. parts 15 and 16, vol. iii. part 4. 1885. 4to.
From Mr. J. H. Gurney, jun., F.Z.S.

——— ——— Journal. Zoology. Nos. 109—113 and 115. 1885—86. 8vo. *From Mr. J. H. Gurney, jun., F.Z.S.*

——— ——— Journal. Botany. Nos. 138—145, 150 and 151. 1885—86. 8vo. *From Mr. J. H. Gurney, jun., F.Z.S.*

Manchester. Studies from the Biological Laboratories of the Owens College. Vol. i. 8vo. Manchester, 1886.
From Professor Newton, F.R.S.

New Zealand Institute. Transactions and Proceedings; edited by James Hector, C.M.G., M.D., F.R.S. Vol. xviii. Roy. 8vo. Wellington, 1886. *From the New Zealand Institute*

——— Index to Vols. i.—xvii. 8vo. Wellington, 1886.
From the New Zealand Institute

Northamptonshire Natural History Society and Field Club. Journal, nos. 24—27. 1885—86. *From the Society*

Northumberland. Natural History Transactions of Northumberland, Durham, and Newcastle-upon-Tyne. Vol. viii. part 2. 1887. 8vo. *From the Society*

Norway. The Norwegian North Atlantic Expedition, 1876—1878. [In Norwegian and English.] Part 14. Folio. Christiania, 1886. *From Professor Newton, F.R.S.*

Contents:—

Part 14. Crustacea, by G. O. Sars. With 21 plates and 2 maps.

Owen (Professor, F.R.S.). On the Genus Dinornis, part 2. [From the Transactions of the Zoological Society, vol. iii.] 1846.
From Mr. C. Williams

——— On the Osteology of the Chimpanzæ and Orang Utan. [From the Transactions of the Zoological Society, vol. i.]. 1835. *From Mr. C. Williams*

Paris. Feuille des Jeunes Naturalistes. Nos. 186—197. Avril, 1886—Mars, 1887. *From the Society*

Plymouth Institution and Devon and Cornwall Natural History Society. Annual Report and Transactions. Vol. ix. part 2. 1885—86. *From the Plymouth Institution*

Russia. Bulletin de la Société Impériale des Naturalistes de Moscou. Année, 1885, nos. 3, 4. Année, 1886, no. 1. *From the Society*

Shaw (George, M.D.). Museum Leverianum, containing select specimens from the Museum of the late Sir Ashton Lever, Kt., with descriptions in Latin and English, by George Shaw, M.D., F.R.S. Published by James Parkinson, Proprietor of the Collection. 4to. 1792. *From Professor Newton, F.R.S.*

Suffolk Institute of Archæology and Natural History. Proceedings, vol. vi. nos. 1 and 2. 1883—85. 8vo.
From Mr. J. H. Gurney, jun., F.Z.S.

United States of America. Fifth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1883—84; by J. W. Powell, Director. Roy. 8vo. Washington, 1885. *From the United States Geological Survey Office*

——— Report of the International Polar Expedition to Point Barrow, Alaska, in response to the Resolution of the House of Representatives of December 11th, 1884. By Lieut. P. H. Ray. 4to. Washington, 1885. *From Lieut.-Col. Feilden, F.G.S.*

——— War Department. Papers of the Signal Service. No. 11. Meteorological and Physical Observations on the East Coast of British America. By Orray Taft Sherman. 1883. 4to.
From Lieut-Col. Feilden, F.G.S.

——— War Department. Signal Service Notes. Nos. 13, 15, 17, 18, 19. 1884—85. 8vo. *From Lieut-Col. Feilden, F.G.S.*

Contents :—

No. 13. The Relation between Northers and Magnetic Disturbances at Havana, Cuba. By G. E. Curtis.

No. 15. Danger Lines and River Floods of 1882. By H. A. Hazen.

No. 17. A first report upon Observations of Atmospheric Electricity, at Baltimore, Maryland. By Park Morrill.

No. 18. The Aurora in its Relations to Meteorology. By Alexander Mc Adie.

No. 19. Report on the Tornado of August 28th, 1884, near Huron, Dakota. By S. W. Glenn.

——— American Museum of Natural History. Bulletin, vol. i. no. 8, 1886; and Annual Report for the year 1885—86.
From the American Museum

Yorkshire Naturalists' Union. Transactions, part 9. 1886.
From the Society

——— Philosophical Society. Annual Report for 1885.
From the Society

ADDRESS.

Read by the President, Sir Peter Eade, M.D., F.R.C.P., *to the Members of the Norfolk and Norwich Naturalists' Society, at their Eighteenth Annual Meeting, held at the Norfolk and Norwich Museum, March 29th, 1887.*

Ladies and Gentlemen—Another of our Society's years has come to a close this day, and it devolves upon me to say a few final words before yielding up this presidential chair. In doing so, my chief desire is to repeat my thanks to the members for having placed me in so honourable a position, and for their kindness in sustaining me throughout the various evening meetings of the session.

It is a matter of much congratulation that these meetings have continued to be well attended, and that the Society itself has continued thoroughly to fill that position of scientific usefulness which was hoped for it at its first inauguration, now eighteen years ago. Such a lapse of time gives the opportunity of seeing how much good work has in the aggregate been done. And though, no doubt, in looking back through our volumes it will be found that different years have produced a varying amount of work judged by its importance, yet on the average we have reason to be well satisfied with what the successive numbers show us, seeing that the total represents a very important collection indeed of natural history facts and information. The work of the present year has, I think, fully maintained the good average attained in other sessions.

The Society too, has, as a whole, continued to prosper, and appears to be effectually carrying out the initial programme set forth on the first page of each volume of its 'Transactions.'

On looking back to some of our earliest annual reports, I find that our numbers have doubled and trebled themselves since that time; and further that the list now embraces the names of many both at home and afar off, whose reputations are well known to science, and who are powerful additions to our Society's strength. As compared, too, with those earlier times, the increased plumpness of our yearly volume tells of the greater amount of matter that is now every year contributed.

So, too, if prosperous finance is any test of success, we may look to the larger figures in our balance sheet, and the sufficiently satisfactory state of our "balance at the bank" further to fortify the favourable position which I desire to point out to you.

We have had an accession of twenty-one new members during the year, whilst seventeen have been removed by death, resignation, or other causes. But though the total losses from these causes have been but few, and those from death not above the average, yet these latter include some well-known names—the names of members of valued attainments, and of men whom the Society could ill spare.

Especially do we note with regret the premature loss, in only middle life, of one who had been a member of this Society from its commencement, who was also a life member of the Zoological Society, and whose death would have claimed attention from us as Norwich men, were it for no other reason than that he bore a name the very sound of which is instinct with ideas of Norfolk Natural History; one who was also a member of a family to which this Society, and the neighbouring Museum, owe a long and ever-increasing debt of gratitude.

Although the late Mr. John Gurney's talents were never, I believe, especially directed to our class of study, yet his tastes for the bright and the beautiful were well known. And though his affliction had of late years debarred him from the complete visual enjoyment of the beauties of nature, yet his devotion to the improvement of the rural charms of his own home, and his public-spirited expenditure upon the scheme for the laying out of Mousehold Heath, and its appropriate development, showed that

he had in him that form of mind out of which the true lover of nature's creatures, as well as nature's charms, necessarily arises.

But this side of Mr. Gurney's mind will come home to us as naturalists much more forcibly when we recall the great act of his life, in which he was so heartily and so earnestly engaged when death removed him so suddenly in the midst of his useful and public-spirited career. I, of course, allude to his great Castle-Museum scheme for the removal of our grand Museum collection, with its surroundings, to a new and larger and more appropriate position on the Castle Hill. We all know the generous liberality with which he sought to ensure this grand scheme being carried out. We have all noted the quiet and business-like sagacity with which the various steps necessary for the effective doing of this work were taken under his inspiration. And I am sure we recognise how he was actuated not only by a desire to raise the scientific *status* of the county and city generally, but also to assist those Norfolk workers in nature's fields whose accumulated results are now to be seen under this roof.

His large and increasing views for the good of this city, and its general welfare, have been so thoroughly and so publicly appreciated on all sides, that it is not necessary for me to add one word more. His name will remain as that of a public man at once generous and right-minded. And I can only hope on behalf of this Society, and that of other kindred ones, that nothing will occur to prevent the full development and carrying out of that Castle scheme, which, if effected, will, in my opinion, have a large and important influence not only upon the future scientific progress of Norfolk generally, but also upon the intellectual position which our famous old city will hold in the time to come.

Mr. Hampden G. Glasspoole, who has also recently died, had been a member of this Society from its commencement, and had contributed two papers to its proceedings. These were entitled "Biographical Memoirs of some Norwich Botanists," and "Memoir of Lilly Wigg." He had also published several papers in 'Science Gossip.' He was for several years a member of the late Norwich Microscopical Society; and of the London Quekett Club.

Mr. Glasspoole was an accomplished botanist. For many of the later years of his residence at Ormesby, he was honorary curator of Botany at the Norwich Museum; and after his removal to London he held, for a short period, the office of botanist to the Alexandra Palace.

He will be remembered by us all as kindly, gentle, and genial; ever ready to help others with his time or his knowledge; and with all his stores of information, modest and unassuming.

He added one species to the British Flora, *Carex trinervis*, Devgl; and two species to our county list, namely, *Ammophila Baltica*, Leak, and *Sparganium neglectum*, Beeby.

As is well known, he was the eldest son of the late Capt. R. Glasspoole of Ormesby, who had himself presented many *curios* to our Museum, and who published a most interesting account of his experiences whilst a prisoner in the hands of Chinese pirates.

The Ornithology of Scotland has, in the death of Mr. Robert Gray, which took place at Edinburgh in Februrary last, lost one of its ablest exponents. Commencing with 'The Birds of Ayrshire and Wigtonshire,' which appeared in 1869, Mr. Gray, two years later, published the more important 'Birds of the West of Scotland,' and at the time of his death was engaged on a similar work treating of the birds of the Eastern district of his native country. In this latter work he was, I believe, associated with Mr. William Evans of Edinburgh, who, it is to be hoped, will bring their joint labours to a successful issue.

Mr. Gray commenced public life in the City of Glasgow Bank, and it was whilst acting as Inspector of Agencies for that establishment that he was enabled to collect the information which so enriched his work on the 'Birds of the West of Scotland.' Subsequently Mr. Gray entered the Bank of Scotland, and at the time of his death occupied the position of its chief cashier. Since his residence in Edinburgh, he has taken a prominent position in the scientific institutions of that city, and was a Vice-President of the Royal Society of Edinburgh, and Secretary of the Royal Physical Society. He did not become a member of

our Society until 1884, but has been long known by several of its members, and highly valued as a correspondent or friend.

The only other member of this Society whose death we have to deplore is Captain Philip Hamond, who has for some time left this city, but who will be well remembered as having resided for awhile at Mousehold House, Thorpe. He showed much interest in the natural history of Norfolk, and also in its antiquities; and he left a valuable collection of books relating to Norfolk.

During the past session we have had many valued *papers* contributed to our Society; besides some notes—shorter, but not necessarily less interesting, or of less value.

We have also had several specimens exhibited. And, in addition, we have had a considerable number of members who have taken part in the various discussions.

I need scarcely remind you how varied these contributions have been; and how birds, beasts, fishes, insects, and smaller creatures; as well as seeds and plants, great and small; have all received illustrations during the year. Distant parts of the globe, too, have helped to supply us with the material which has been brought before us, notably by our late President, Colonel Feilden.

Many of the papers will be published in the forthcoming 'Transactions' of the Society; and to these I need scarcely allude, as they can all be read by us very shortly. But I should scarcely like to omit to mention the beautiful botanical specimens exhibited by Mr. Long of Wells, at our last meeting. The rarity and interest of some of them, the beauty and finish of the mountings, and the true scientific intelligence displayed in all, can but make us desire that so competent a collector would not only further explore his district, but also enrich this Society by the exhibition of the fruit of his researches.

As to the contributions which will not appear in our 'Transactions':—At the May meeting, Mr. F. Sutton read some interesting notes on Strawberry growing. In October, Mr. Southwell read extracts from the records of the Whaling s.s. "Eclipse" in the Greenland seas. Mr. Southwell's notes referred more particularly

to the natural history occurrences of the voyage; the birds and animals met with. And he exhibited several forms of Whale and Seal food, consisting of Crustacea and various minute organisms; as well as the skulls of two Greenland Seals, two Ringed Seals, and a Polar Bear, sent him by Mr. Robert Gray,—all which latter he has presented to the Norwich Museum. He also exhibited a very rare little fish of the genus *Scopelus*, likewise taken by Mr. Gray.

At the same meeting, our most valued and efficient member, Mr. Geldart, read a paper on the *Calanus finmarchicus* or Rice Food of Whales, from the West Coast of Spitzbergen, and illustrated by it the natural law of gradation in feeding, showing that whilst some Whales themselves eat this food, others devour the Cod and Herring, which eat these little crustaceans, which again eat the diatoms, found floating in such enormous numbers on the surface of those seas.

My own humble contribution to the proceedings of our last meeting, in the shape of a paper on the habits of some of our town birds, entitled "My Christmas Garden Party," has been recently published in *extenso*, and therefore need not be further alluded to here.

There has been only one *Excursion* made during the year, but this appears to have been full of interest and enjoyment. I have received a lively and detailed account of the day's proceedings from Mr. Bussey, but I regret that time only permits me to note the principal features of the occasion.

The visit was made to the Salhouse and Wroxham Broads, and the neighbouring district, including the Broomhills, St. Benedict's Abbey, and portions of the river Bure. It is unnecessary to say how ample is the material in this district for the study of both the animal and vegetable kingdom; and as the day was fine, the opportunities afforded were fully availed of. As usual, this occasion for field study fully repaid those who took part in it, for their devotion of the day to this pleasant combination of research and recreation.

The field over which "Natural History" extends is a very wide

one, and properly includes the study of all organised beings, living and dead. At one end the ground is, to a very considerable extent, occupied by the Geological Society, which exists in Norwich; yet even in this department we have had, as I have said, some very valuable contributions during the year. But at the other end, which embraces the study of minute or microscopic life, not only have we had no contributions during the past session, but I find, on looking over the past numbers of our 'Transactions,' that the papers dealing with this part of the world's life, have been both few and far between. There have been, as we know, some great and valuable exceptions, such as the papers read by Mr. Kitton, the address by Mr. Plowright, a portion of the address read by the President, Mr. Sutton, two years ago, and, perhaps, one or two others. Still the small part which microscopical records and observations play in our annals is both noticeable and regrettable,—the more so, because in consequence of the decease of the old Norwich Microscopical Society, I believe that no public or systematic work in this direction is now being carried on in this city. And yet, partly in consequence of the larger forms of life having now been so largely studied, but still more in consequence of the new views as to the universality and far-reaching importance of microscopic living beings,—there is probably no phase of natural history which is now more engaging general attention, or which is being more eagerly studied and investigated elsewhere.

Mr. Sutton, in his presidential address of 1884—85, gave a most learned and interesting description of some of the microscopical researches which had been carried on up to that time, and further gave us a most lucid account of the influence which micro-organisms had been shown to exert in the process of nitrification in soils, an influence which had formerly been considered to be due to purely chemical action.

I trust I may be forgiven if I recall your attention for a few moments to this subject of Germ life, more particularly as it branches out and develops in a more vital direction; in other words as it affects human and animal life.

This portion of the subject has, during the past two or three years, deepened and strengthened in interest; our knowledge of it has largely increased; and the recognition of its vital importance has called forth, both in Europe and America, a host of eager and capable workers. It is scarcely too much to say that its wide and far-reaching issues are probably the most important to mankind of any that have been studied in recent times. Foremost amongst the workers in this department may be recalled to you the well-known names of Koch and Pasteur, abroad; and of Lister, Watson-Cheyne, and Crookshank, in this country. But the names of other eminent investigators will almost necessarily occur to your minds.

It has long been known what potent factors were microscopic Germs in producing changes in the constitution of decaying matter; and how they were, in all probability, the useful scavengers of nature, definitely resolving into their constituent elements failing and dying organic tissues. But it has become more and more a matter of knowledge, that by their parasitic habits and their power of invading and living upon and within other living tissues, they are also the sources of many so-called diseases of both vegetables and animals.

With regard to vegetable parasitic growth I will not now detain you. The blights, and the mildews, and the ergots, as well as minuter forms, such as algæ and micrococci, are well known; and no doubt much more is still to be learned from their further investigation; whilst by analogy it seems highly probable that the circulating fluids of higher members of the vegetable kingdom may be found to be invaded by parasitic beings in the same way as their animal compeers.

But it is to Germ life in animal bodies that I wish now specially to allude. I have said that our knowledge in this direction has, even in the last two or three years, made enormous strides, and it is now almost a matter of certainty that all contagious or infectious disorders, as well as many others, are but the expression of the fact that minute living bodies have made a resting-place for themselves in or upon other living tissues; and that the development of the phenomena of these morbid states is but an indication

of their presence and reproductive activity,—either as cause, or as an accompaniment of these disease manifestations. And this applies not only to the human species, but to lower classes of animals, between whom and man many of these diseases are interchangeable.

Such knowledge necessarily invests the life history of these minute Germs with intense interest, seeing that it is probably one step, and that a long one, towards the discovery of the means of prevention, if not also of cure, of many of our most fatal and dreaded diseases.

Examples of such diseases are:—Scarlet Fever, Diphtheria, Small Pox, Cholera, Yellow Fever, Tuberculous Disease, Ague, Hydrophobia, Cattle Plague, Anthrax; and many others might be enumerated whose dependence upon parasitic Germs is almost conclusively proved. But these are sufficient to show the deep interest of this branch of study.

Not only are these Germs found in the solids of the body in some of these diseases, but in others their presence is easily and constantly recognizable in the blood or other fluids, and even within the corpuscles which the blood so largely contains. And not only so, but the forms which these micro-organisms present are so constant and so definite in the different disorders, that it is now almost possible in some instances to diagnose what diseased condition we have to deal with by an examination of the fluid or tissue in which they are contained.

It is, perhaps, but right here to say that some of our most cautious observers consider that it is as yet hardly *proven* that the differing Germs found in the various diseases are their actual and efficient cause; but their definiteness in the various disorders, and the constancy of their presence, leave little doubt that this will hereafter be conclusively shown to be the case.

Some of these Germs seem to have a short life and rapid development, and then we have acute disease. Others seem to have a more prolonged or continuing career, and then we have chronic disease. Whilst others seem to have an intermitting development, and then we have paroxismal disease.

Many curious facts have been observed in reference to the forms, or multiplication, or life-history of some of these parasitic beings. Thus, for example, in one class *(Filaria sanguinis)* it was noticed that the minute embryos of this little blood-worm could only be discovered in the evening or during the night, and not during the day; and the reason of this has appeared to be that it is necessary that they should come within reach of the Mosquito Knat, which is a night-feeding animal, in whose bodies one stage of their development appears to take place.

One of the latest discoveries in this department of natural history is that of the blood germs, which co-exist with the various forms of ague and malarious disease, and upon which they would appear to depend. Dr. Osler of Pensylvania, has recently described and figured these little bodies in an elaborate paper full of interest.

Such facts as these, when regarded merely from the point of view of a member of the Medical Profession have their deep and *special* significance. But I am here to-night as a member of the Naturalists' Society, and by all of us, in that capacity, they are first to be regarded, not as illustrations of disease, but of the life history of some of nature's creations,—creations which are no doubt as important, as definite, and which play as large a part in the general scheme of life, as do many of the larger forms of animated beings.

Some of these little bodies, especially those of the bacillary and bacterial class, are extremely minute, and are best examined with powers ranging from one-tenth to one-twenty-fifth of an inch; and it is impossible to ignore the fact that their study requires not only good instruments, but much patience and skilled attention. Nevertheless, such study fairly comes within the scope of this Society's work, and will most certainly repay any of its members who may be induced adequately to undertake it.

Nor let it be said that minuteness is any reason for lack of interest on the part of the naturalist. For many of these micro-organisms have already been shown to be as varied, and to have as definite a structure, and as special a life history, as any of the

larger types of beings; whilst, of course, we all recognize that apparent size is as nothing, that it is a mere accident, a question of the construction of our enquiring eyes, a condition that is at once altered and rectified by a magnifying glass.

If it be true that the invasion and presence of various small organisms in the blood or tissues is the cause of the various specific diseases to which I have alluded, then the application of such knowledge as naturalists can obtain, as to the food and other conditions necessary to their existence; their mode of ingress to the body; their development and multiplication, becomes clear and obvious. It opens up to our minds possibilities both of prevention, and of either mitigation or cure. For it is evident that if we can starve these Germs of their necessary nutriment, or make their new habitation unsuitable for their healthy and vigorous development, their career as invaders will necessarily either be cut short, or be rendered feeble and impotent; and therefore the disease-changes which they can produce less violent and less lethal.

Something of this kind appears naturally to have taken place in those persons in whom some of the zymotic diseases (of which Measles, Scarlet Fever, Whooping Cough, &c., may be taken as familiar types) have once run their course; in those, that is, who are popularly said to have already had these diseases. And although the exact abiding change which is produced has not been ascertained, yet it is well known, and quite understood, to be one which renders the fluids or tissues partially or wholly unsuitable for their future healthy growth.

This theory, too, is the well-known explanation of the protective power of the Cow Pox, which once having permeated a human system, has rendered it unsuitable for the future healthy and vigorous development of its greater relation—the Small Pox.

In default of available means of destroying the Germs of other malignant diseases, prolonged efforts have been made (and notably by the great French pathologist, Pasteur) so to diminish the intensity of the destructive force of some of these specific Germs, that they may be safely inoculated into human bodies without danger to life, and yet be potent enough in their effects to anticipate

and render abortive the invasion of the more virulent diseases. This has been attempted by repeated cultivations of the Germs in proper media, until after several of such generations the broods shall have acquired the requisite diminished vitality,—in fact, until that diminution of virulence which the Small Pox Germ has sustained in passing through the Cow has been obtained by these artificial means.

We are all familiar with the attempts which have recently been made by Pasteur in this direction, in regard to that most fatal disease Hydrophobia. It remains to be seen how far he has been successful in solving this preventive problem; and how far this may be the true method by which to utilize our knowledge of bacterial life. Medical men are diligently working at this subject from their own point of view. There is much to be done by microscopic naturalists in the unravelling the life-history of these little beings; and we are glad to recognize the kind of results which may be hoped for in the future.

Such considerations as these are fraught with matter for deep reflection, and tend to open our minds to the far-reaching possibilities not only of this special knowledge, but of that which we are gaining in many other branches of science. Each fresh item of knowledge is like a new step upon a ladder, and raises us to a fresh height from which we can take a wider survey, and which we can assume as a loftier and broader basis for further enquiry. Scientific thought is ever as to what may next be done, and how to do it. For, as Sir James Paget has recently said: "Every increase of knowledge brings before us a larger and clearer view of the immeasurable quantity which is still to be gained. The more we know, the more can we see, if we will, how much more there is that we do not know." And of this we may be sure, that it is by minute and exact work only that in the future our store of knowledge is to be increased and made sure. If no other example to prove this were at hand, it would be sufficient to quote the recent observations of the Rev. Dr. Dallinger on the subject of the conjugation of the nuclei of some minute forms of cell life: observations which bring us nearer to some definite knowledge of this particular matter than any hitherto made upon higher classes of creatures.

Dr. Dallinger has spoken of the "vast area of activity and research in this direction;" and Professor Huxley has said, "that those who have toiled for the advancement of science are in a fair way of being overwhelmed by the realization of their wishes."

We appear indeed to be still only on the threshold of knowledge, to have merely touched the fringe of the vast and infinite life-history which the living world, that inexhaustible stream of life which we see everywhere around us, contains. We are proud of the amount of our natural history knowledge. We think to have accumulated a large store of information as to that especially of our own district. We can point to the lists of animals and plants which the research of the members of our Society, and others, has so laboriously gathered together. And we can look to the stores of our Museum as illustrations of what has been done. And yet a little further consideration at once shows us how small a part this is of what is yet to be known. We know the gross form of the specimens; we know something of their habits during life; and yet how little is this of what there is to be known about them. Who is there of the most learned who can properly explain the meaning of one hundredth part of what these creatures present in form, size, colour, and intimate structure? We have a general idea that their special peculiarities have relation to the two primary essentials of life,—the daily bread, and the perpetuation of the species,—but we are largely unable to explain the *raison d'etre* of many of the commonest facts which they present. It will be a great day when we can also explain the object or utility of all the variations which they present.

Of course I do not forget the powerful impulse given by the researches of Darwin in the direction of explaining the why and the wherefore. I only indicate how large a portion of this explanatory field is yet untilled.

In this county a Naturalists' Society will never lack either for material to work on, or for variety and interest of subject. Much, even in its grosser form, still remains to be learned. And the vast variety presented by the county, in respect of climate, soils, strata, heath, woodland, marsh, stagnant and running water,

as well as the proximity of the great ocean with its shore,—presents an almost unexampled field for the work of the scientific naturalist,—a field, too, which is constantly changing in accordance with the physical and other changes steadily going on in the district.

With these great natural advantages, and with the great love for natural science, which is inherent in Norfolk men, I make bold to hope and prognosticate for this Society a prolonged and continuously useful career. We are glad to see its library growing, and its journalistic interchanges increasing. We are glad of the increasing importance of the position which it holds amongst kindred societies. We are all, I am sure, looking forward to the time when this, our Society, will meet in a handsome airy room on the top of the Castle Hill; when any student of any particular branch of this natural history will be able (on repairing to our Museum) to see not merely inaccessible specimens ranged three or four deep, but so displayed as to be available for study and examination; when lectures and demonstrations will be possible, because there will be sufficient room space to contain both the lecturer and his audience; in short, when we in Norwich shall have a scientific centre worthy of the Museum and of the great reputation which this district has always held.

What a happy change, too, when the old Castle of Norwich—the last of our three city prisons—shall exchange its human prisoners for forms, imprisoned indeed, but not human; and intended only to enlarge and instruct and make more free the mind of man. And when Science and Art and the cultivation of the intelligence shall tend year by year, and ever more and more, to render real prisons less and less required. And when the moral sense and the force of cultivated public opinion shall suffice to reduce crime and ill-doing to its minimum. We gladly recognize how much has already been done, and we look forward with hope in both these directions to the good time coming.

In now resigning this chair to my learned and distinguished successor, I can only trust that he will find his year of office as pleasant, and as profitable to himself, as the Members of this Society, and their excellent Secretary, have rendered mine to me.

I.

ON THE BIRDS OF THE LENA DELTA.

By Henry Seebohm, F.Z.S.

Read 27th April, 1886.

A very important contribution to the geographical distribution of Birds in the Arctic Regions has recently appeared in the 'Mélanges Biologiques tirés du Bulletin de l'Académie Impériale des Sciences de St. Pétersbourg,' xii. livr. i., pp. 31—107, 1884. The information is contained in a letter from Dr. Alexander Bunge addressed to Dr. Leopold von Schrenck, the well known author of 'Reisen und Forschungen im Amur-Lande.' The letter is dated from Sagastyr, 30th March, 1884, and gives the result of the ornithological and other observations made during the year 1883 at the Russian Polar station. Authorities differ as to the exact latitude and longitude of the delta of the Lena, but Nordenskiold places it in the same latitude as the delta of the Yenesay, so that it is probable that Sagastyr lies about latitude 73½°, perhaps 1½° further north, and 44° further east than Golcheeka, the highest point which I reached in the valley of the Yenesay.

The valley of the Lena is probably colder than that of the Yenesay. Dr. Bunge states that the mean temperature never rose above freezing point between the 20th of September and the 28th of May. The ice on the river, which had attained a thickness of six feet, began to break up on the 8th of June, and had all disappeared by the 25th. On the 29th of May the first insect was seen, and a month later the first flowers appeared.

Falco gyrfalco (?). An example of one of the various forms of Jer-Falcon was obtained from a Yakut. It was a young female, and had been caught in a fox-trap.

Haliaetus albicilla (?). Eagles were occasionally seen, but were not identified. They were probably the White-tailed Eagle.

Falco peregrinus. The Peregrine breeds in the mountains south of the delta.

Buteo lagopus. The Rough-legged Buzzard also breeds in the mountains south of the delta.

Surnia nyctea. The Snowy Owl also breeds in the mountains. One arrived in the delta on June 12th.

Saxicola œnanthe. The Wheatear was only seen in the south of the delta.

Corvus corax The Raven is said to remain all the year round on the mainland, and was occasionally seen on the delta.

Emberiza nivalis. The Snow Bunting was the second bird of passage to arrive in spring, and was first seen on May 6th. Eggs were obtained on June 27th, and young were seen on July 18th.

Emberiza pusilla (?). A small Bunting, probably the Little Bunting, arrived on May 29th, and eggs were taken on July 4th.

Anthus cervinus (?). Pipits were occasionally seen, probably the Red-throated Pipit.

Motacilla ocularis. Wagtails were obtained on the mainland, south of the delta, which were identified as the species found by Middendorff on the Boganida.

Garrulus infaustus. The Siberian Jay was only found in the south of the delta.

Cypselus (Sp. ?). A small Swift, dark grey above and white underneath; is said to have been seen in autumn south of the delta. It was most probably a Sand Martin.

Lagopus albus. The Willow Grouse leaves the tundra in late autumn and migrates south to the forests. It is the first bird to arrive, and was seen in 1882 on January 17th; but the year following not until February 9th. Their crops were full of Willow buds. Eggs were obtained on July 5th, and young in down on the 28th.

Lagopus alpinus. A Ptarmigan, breeds on the mountains south of the delta, and is probably the same form as that which I shot at Golcheeka. It appears to me to be quite as distinct from the Iceland form as that is from the Scandinavian bird.

Charadrius minor. The Little Ringed Plover is only found in the south of the delta.

Charadrius morinellus. The Dotterel was only once seen in the north, and once in the south of the delta.

Charadrius fulvus. The Asiatic Golden Plover is much commoner in the south of the delta than in the north.

Charadrius helveticus. The Grey Plover was seen on June 10th, and eggs were obtained on the 24th. As it is described to have been rarer in the south of the delta, it seems probable that at Golcheeka, where I saw no trace of it, I was not quite far enough north. It probably never breeds far from the coast.

Strepsilas interpres. The Turnstone arrived early in June, and was afterwards found breeding.

Phalaropus fulicarius. The Grey Phalarope is described as the commonest wading bird on the island. It arrived on June 13th, and eggs were obtained on the 29th. The nest was merely a slight depression in the moss, and the birds were as tame as the Red-necked Phalarope is.

Totanus pugnax. The Ruff was seen on June 16th.

Tringa subarquata. The Curlew Sandpiper was only seen passing through on migration in small flocks during the middle of June. Like the Knot, of which nothing was seen, it doubtless breeds much further north, a fact which will account for its late appearance in the south of Europe in breeding plumage. I have shot this bird on the shores of the Black Sea as late as June 1st.

Tringa alpina. The Dunlin arrived early in June.

Tringa minuta. The Little Stint arrived on June 13th, and eggs were obtained on July 6th.

Tringa temminckii. Temminck's Stint appears to have been much rarer than the Little Stint, but two examples were obtained on June 12th.

Calidris arenaria. A Sanderling was obtained on June 4th. It was sitting in the snow.

Sterna arctica. The Arctic Tern arrived on June 10th. It was much commoner in the south of the delta than in the north.

Larus sabinii. Sabine's Gull arrived on June 10th, and was by no means rare. Dr. Bunge did not however succeed in finding the nest.

Larus rossi. Dr. Bunge was fortunate enough to shoot two examples of Ross's Gull on July 8th. The Yakuts told him it was very rare.

Larus canus. The Common Gull arrived on June 7th.

Larus affinis. The Arctic Herring Gull arrived on May 21st. Eggs were obtained on June 24th, and young on July 18th. It was last seen on September 26th.

Larus glaucus. The Glaucous Gull arrived on May 28th. A month later eggs were obtained, and the last bird was seen on September 26th.

Larus eburneus (?). Two small white Gulls were seen on June 3rd, which may have been Ivory Gulls.

Stercorarius richardsoni and Stercorarius buffoni. Both Richardson's and Buffon's Skua were first seen on June 6th, but only the latter was found breeding.

Colymbus septentrionalis. The Red-throated Diver arrived on June 5th. Eggs were obtained on July 11th, but by the middle of September the birds disappeared.

Cygnus musicus and Cygnus bewicki. Dr. Bunge says that the Swans arrived on May 20th, and that he obtained much incubated eggs on June 28th. He maintains that intermediate forms were very common, and that he saw examples of the Mute Swan, but was unable to obtain them. This is extremely improbable; they were doubtless examples of *Cygnus americanus*.

Anser segetum. The Bean Goose is the common Goose of the south of the delta, but is very rare in the north.

Anser albifrons. The White-fronted Goose was first seen on May 19th; great numbers appeared on 28th; and eggs were obtained on June 23rd. On July 22nd, a thousand old birds in full moult and unable to fly were surrounded and caught by the Yakuts. Dr. Bunge says they varied much in size, but in none did the white on the forehead extend as far on the crown as it is described in the Little White-fronted Goose.

Anser brenta. The Brent Goose passed through on migration from June 7th to the 24th, evidently for the purpose of breeding further north.

Anser glocitans. The Baikal Teal arrived on June 18th, in flocks consisting almost entirely of males. Dr. Bunge suggests that they had come up north to moult, leaving the females further south to perform the duties of incubation.

Fuligula nigra. The Black Scoter was first seen on June 7th, but was very rare.

Fuligula glacialis. The Long-tailed Duck arrived on June 10th, and was common. Eggs were obtained on 23rd.

Somateria stelleri. Steller's Duck was seen on June 10th, and was not uncommon. Two eggs were brought in on July 4th.

Somateria spectabilis. The King Eider was seen every day after June 10th, and eggs were obtained on 24th.

II.

ON THE BIRDS OF THE EXTREME NORTH OF ALASKA.

By Henry Seebohm.

Read 27th April, 1886.

Precisely at the same time as Dr. Bunge was studying the birds of the Lena Delta, an American expedition made important collections at Point Barrow, about 1½° further south, and 80° further east.

The ornithological results of their visit to the high north are published in a 'Report of the International Polar Expedition to Point Barrow, Alaska,' pp. 104—128, written by Mr. John Murdoch, who collected most of the birds and eggs. The mean temperature never rose above freezing point in 1882 from the previous 19th of October to the 12th of May, and in 1883 from the previous 2nd of October to the 25th of May. The first flowers were seen in bloom at the end of June, so that practically the climate of Point Barrow may be regarded as exactly the same as that of the Lena Delta.

Falco gyrfalco sacer. The solitary Gyrfalcon obtained did not probably differ from that found on the other side of Bering's Straits.

Aquila chrysaetus canadensis. This species was identified from a skin obtained from the natives.

Surnia nyctea. The Snowy Owl appeared to be a resident.

Saxicola œnanthe. The Wheatear arrived on May 19th, and for three days passed in some numbers, but none remained to breed.

Emberiza nivalis. The Snow Bunting arrived in 1882 on April 9th, but in 1883 not until 16th. They began to build early in June, and were very common. They were last seen September 20th.

Emberiza lapponicus. The Lapland Bunting arrived on May 20th, and was common. Eggs were obtained June 6th, and the birds disappeared September 4th.

Fringilla linaria exilipes. The small white rumped form of the Lesser Redpole was rare, but the bird and eggs were obtained June 13th.

Zonotrichia gambeli intermedia. A solitary example of the White-crowned Sparrow was caught on September 14th.

Junco hyemalis. A solitary example of the Black Snowbird was caught May 24th.

Hirundo riparia. Very rare stragglers in autumn.

Lagopus albus. The Willow Grouse was said to be a resident.

Lagopus rupestris. The Rock Ptarmigan was a resident.

Charadrius fulvus virginicus. The American Golden Plover arrived on May 21st, and was evidently nesting before June 20th. Both parents take their turns in sitting on the eggs.

Charadrius helveticus. The Grey Plover was very rare.

Strepsilas interpres. The Turnstone was rare in spring migration and during the breeding season, but the young were common in August.

Phalaropus fulicarius. The Grey Phalarope was one of the commonest birds. It arrived early in June, and eggs were obtained by the middle of the month. The nest was a hollow in the grass, lined with a little dry grass. The males alone sat upon the eggs—the female is more richly coloured than the male. They were exceedingly tame.

Phalaropus hyperboreus. The Red-necked Phalarope was a very rare straggler.

Totanus rufus uropygialis. The eastern form of the Bar-tailed Godwit was a rare straggler in autumn.

Tringa subarquata. A solitary example of the Curlew Sandpiper was obtained on June 6th.

Tringa alpina. The Dunlin arrived late in May. They were very common. Both parents shared in the work of incubation, and the young are hatched early in July.

Tringa canutus. The Knot is very rare.

Tringa pectoralis. The Pectoral Sandpiper was one of the commonest of the waders. It arrived about June 1st, and eggs were taken on the 20th. They were previously unknown. Through the kindness of the Director of the Smithsonian Institution in Washington, I was able to figure one of these eggs in my 'History of British Birds' (plate 68).

Tringa bonaparti. Bonaparte's Sandpiper, the American representative of the Curlew Sandpiper, was a very rare straggler, two examples only being secured.

Tringa bairdi. The Lesser Pectoral Sandpiper arrived end of May, and eggs were obtained late in June.

Tryngites rufescens the Buff-breasted Sandpiper arrived in great numbers about June 7th; many nests were taken, always on the "black tundra," and by the first week in August the birds disappeared.

Ereunetes pusillus. The Sempalmated Sandpiper passed in great numbers, on the autumn migrations, from the end of July, gradually disappearing by the middle of August. They were all young birds.

Ereunetes griseus scolopaceus. The western form of the Red-breasted Snipe was rare during the breeding season, but numbers of young birds passed through about the middle of August.

Numenius borealis. The Eskimo Curlew was not common, and only seen on migration, chiefly in spring (late in May).

Sterna arctica. The Arctic Tern arrived about June 10th, and none were seen after the end of August.

Larus sabini. Sabine's Gull arrived about June 1st, and was by no means uncommon. They were evidently breeding in the neighbourhood, but the nest was not found.

Larus rossi. The expedition was fortunate enough to obtain more examples of Ross's Gull than were previously known to exist in all the museums of the world put together. They were very abundant, on migration, from the last week of September to the last week of October, principally young birds flying north-east.

Larus kumlieni. This was probably a young *Larus affinis*, as it is described as small, dark, and immature.

Larus glaucus. The Glaucous Gull arrived early in May, but its eggs were not found, though it was seen during the summer.

Larus eburneus. A few examples only of the Ivory Gull were seen, but none secured.

Stercorarius pomarinus. The Pomarine Skua was the least common of the three species, but a regular summer visitor.

Stercorarius richardsoni. Richardson's Skua was commoner than the last mentioned species.

Stercorarius buffoni. Buffon's Skua was by far the most abundant of the three species, and arrived late in May. They leave late in August.

Colymbus septentrionalis. The Red-throated Diver was very common, and its eggs were procured.

Colymbus arcticus pacificus. The Pacific form of the Black-throated Diver arrived early in June, and was common.

Colymbus adamsi. The White-billed Diver arrived about the end of May, and remained during the summer.

Alca grylle. The Black Guillemot was a resident as long as any open water was to be found.

Alca troile arra. This Guillemot is an intermediate form between the Common and Brünnich's Guillemots. It was a somewhat rare straggler.

Grus canadensis. The Little Crane was a rare straggler.

Cygnus americanus. Swans were occasionally seen, but none secured.

Anser hyperboreus. The Lesser Snow Goose was occasionally seen from the middle of May to the end of June.

Anser albifrons gambeli. The American White-fronted Goose was first seen May 16th, and were very abundant. Great numbers are secured by the Eskimo when they are moulting and are unable to fly. The nest is always placed on the "black tundra," and lined with moss and down.

Anser brenta nigricans. The Pacific form of the Brent Goose, is principally known on migrations, but a few remain to breed.

Anas acuta. The Pintail was only seen on migration.

Fuligula glacialis. The Long-tailed Duck arrived late in May, and was one of the commonest birds. They begin to lay about the middle of June.

Somateria stelleri. Steller's Duck arrived early in June, and was common on migration.

Somateria spectabilis. The King Eider was by far the commonest bird at Point Barrow. They arrive end of April or beginning of May. Thousands pass on migration, and a few remain to breed.

Somateria fischeri. The Spectacled Eider was rare, but evidently bred in the neighbourhood.

Somateria V-nigrum. The Pacific Eider does not appear until the middle of May, and is not nearly so common as the King Eider. The Natives said that it bred further east.

A comparison of these two lists of birds shows results which are decidedly in favour of an Arctic Region. Out of about fifty species found in the Lena Delta, thirty were also found at Point Barrow, and of the twenty which were not found in the latter locality, at least half were only rare stragglers from the Palæarctic Region, whilst of the twenty-four found at Point Barrow, but not in the Lena Delta, at least a third were rare stragglers from the Nearctic Region.

[N.B.—The two preceding articles have not been revised by Mr. Seebohm, owing to his absence from England.—Ed.]

III.

PRIEST ISLAND AND ITS BIRD LIFE.

By J. A. Harvie-Brown, F.R.S.E., F.Z.S.
(Member of the British Ornithologists' Union).

Read 27th April, 1886.

Priest Island is shown upon sheet No. 101 of the 1-inch Ordnance Survey Maps. It will be seen on examination that it is as nearly as possible one mile in length from north to south, and almost exactly the same in breadth, from east to west. It may be said to form the outermost island of the group of the Summer Isles of Cromarty, though forming, politically, a part of Rosshire.

Priest Island is somewhat difficult of access, and not an easy island to land upon if there be the least swell upon the ocean. We visited it from Gruinard Bay, in Rosshire, on a long summer day, when there was scarcely a breath of air, and our men had to row most of the long way from the entrance to Gruinard Bay; so calm was it that we landed with perfect ease on perhaps the most exposed part of its very exposed coast-line. Sir Donald Munro mentions this island as Eilean na-clerache, which name appears on the map also. He says (p. 55) :—"Northwart fra this ile (e. g. Grwynorde), lyes an ile callit Ellan Naclerache, an haffe mile lange, guid for gerssing and wyld fowls eggs, perteining to M'Enzie."

On July 4th, 1884, a fishing friend and myself, accompanied by our good friend Mr. D. Murray, of Gruinard House, and three sturdy highland boatmen, started early in the morning for the distant Priest Island. For nearly a month we had been resident in the Iron House on the River Gruinard; but notwithstanding an even flow of water and good angling weather, we all three had

been forced to the conclusion that the glory of summer-fishing had departed from this river; although only a short decade previously, one pool alone had yielded to one rod no less than twenty-three Salmon and Grilse in one day, all taken with the fly, by a comparative tyro in the art. "They are not in it," was our oft-repeated cry. It will become a later river, year by year, until finally the great old autumn breeders alone will obtain access to the spawning grounds, and spring and summer-running fish will have become amongst the things that were. It is incredible that many west country lairds are so blind to their own ultimate interests, that they permit such havoc to take place amongst the fish that lay the golden eggs. It *is* conceivable where interests jar; but where an exclusive right exists, *ex adverso* of all adjoining properties, it is, indeed, incomprehensible and suicidal. But this is a digression from the true subject of this paper.

A very faint breeze here and there helped us upon our way, and as I have said, our men had to row most of the way there, and most of the way back. Thunder was pealing amongst the splintered peaks of the Rosshire mountains, working most of the day in a semicircular sweep, touching Bein-Mohr, of Cromarty, in the north, and rolling back upon itself again among the hills of the Loch-an-shallag Deer Forest, but not reaching out to sea nor over us. Finally the storm passed away south-west, towards Skye. Rain fell heavily about the head waters of our salmon river.

Approaching from the south, Priest Island appears a rounded red-coloured lump of considerable elevation. It is composed of dark, red, hard, porphyritic looking hornblende (?) which we found great difficulty in breaking.

The southern portion of the island rises to a height of two hundred feet, slopes, near the centre of the south aspect, to the south shore rapidly from the summit to the sea at an angle of rather less than 45°, the bare rock showing prominently in large patches, or elsewhere covered by a close-set turf of sea-grasses and rock-plants. East and west of this abrupt slope the rock is more or less broken up into cliff face, or isolated rocks and lumps, with, here and there, little bits of boulder-strewn and water-rounded beach. Being dead calm a landing was easily effected at the foot of the steep slope; and on such a day a landing could have been made, we believe, on almost any part of the island except sheer

cliff-face, though we were assured that with the least swell it is both difficult and dangerous to attempt it. This, with the experience we have had of similar places is readily credited.

In a dip on the face of the slope, in a grassy dry hollow, we lunched. The view to the south was somewhat hazy and indistinct, being partly obscured by the successively rolling thunder-clouds. Looking south from our lunching spot, on the right appeared Greenstone Point the western horn of the crescent of Gruinard Bay, and beyond the headlands that guard the entrance to Loch Ewe, and dimly looming through haze, parts of the Long Island and the north-west portions of Skye.

On our left, close at hand, the more southern of the Summer Isles,—if we include in the group, Bottle Island, Cairn Tor, and Cairn Deas—and beyond these, Bein Mohr Coigeach above Ullapool and the mountains of the Rhidorroch Deer Forest; and nearer, the entrance to Big Loch Broom. (Greenstone Point and Statig Point on the south side of Little Loch Broom, are the natural guardians of Gruinard Bay, and ought to have been the salient points in the estuary line fixed by the Royal Commission, instead of where it now is, almost intersecting the fresh flow of the River Gruinard itself at low water.) A grand background of mountains, beginning at Bein Mohr of Coigeach encircles the bays and arms of the sea. Amongst these are Bein Goleach (2082), Sahl Mohr, and Sahl Beg. The Two Bens Deraig, and the encircling rim of the Schallichs, Sgeire Fionn in the Strath na Schallich Deer Forest, and the mountains of the Fisherfield Forest.

After lunch we started to walk over the island. We visited seven fresh water lochs, saw the remains of old crofts, and a curious and perfect circle of stones, lying flat on their sides with the ends toward the centre, and sunk flush with the surface of the sward. I measured the size of the circle, but, curiously, I cannot find that I noted it down. The stones themselves, however, were each three feet long, and the diameter of the outer circle, as far as I can recollect, was nine feet, leaving the inner circle, formed by the other ends of the stones, as six feet. Not being myself an antiquarian, I was at a loss to know what these were, and fancied they were connected with ancient rites or superstitions. I made a rough sketch of the curious circle, and forwarded it afterwards to Dr. J. Anderson, the talented curator of the Collection of

Antiquities in the Museum of the Society of Antiquaries of Scotland, and in reply to my enquiries he wrote under date of April 4th, 1885. "The curious circle of stones laid flat which you describe as in the centre of the remains of the old village on Priest Island does not resemble any prehistoric construction that I am acquainted with. I mean that I cannot recognize it as belonging to any known class of such structures. From its position in the centre of the village, I would be inclined to look for an explanation in some casual, local, or special purpose of no great antiquity, as I do not suppose the village can be regarded as prehistoric. I do not think there is any notice of Priest Island, unless it may be in the statistical account." The new statistical account merely mentions that Priest Island was at that date sometimes inhabited; and up till now I have not been able to find out anything further regarding this curious (to my eye) circle of stones, which are nine in number, and at regular and equal distances from one another. Some are more chipped than others, whilst all are very smooth and polished on the exposed surface, and some have retained their original parallelogramatic shape almost perfect. It has been suggested that it is an old smith's forge, but perhaps some one of the Society can put this at rest and explain its origin and use.

The Southern and highest part of Priest Island is sharply defined and separated from the northern portion by a fine mural precipice, where evidently a pair of Peregrine Falcons had their dwelling-place. The north part of the island contains at least seven brackish water lochs, all of which we visited. Two of these lochs are of some magnitude. Round the shores of one of the larger, a colony of Lesser Black-backed Gulls were breeding, and we saw the young.

Having been informed that Trout existed in these lochs, but feeling profoundly sceptical, and having brought a fly rod, we tried in vain to raise a fish; but we could see that they were densely stocked with Sticklebacks and crustacea, and also numbers of large Eels, which scuttled out from the conferva-laden stones into the dark porter-coloured water. Cormorants were on the still lakes, and we disturbed a Wild Drake casting his quills and in the partial plumage of the Duck.

The island is curiously rugged and broken in its orographical outline; and standing in any one of its many dips and hill-circled

hollows, and looking thence seaward, it would be difficult to say, were the fact not known, whether it was an island or part of the mainland.

Of flowers and wild plants we noticed Wild Parsley, a kind of pink snap-dragon like flower, rock plants, and Sea-pink, and on the deserted croft-land, Gowans and White Clover. Heather grew rank and strong over the knobbies and hills of the northern portion, and rank grasses round the gull-frequented loch-shores. Much sweet pasture-ground was interspersed, capable of carrying quite a number of Sheep and Cattle.

To the North, and close to Priest Island, lies the island of Glaskeir Bheag—frequented by Greylag Geese—and the Summer Isles to the north-east, the point of Stoir, and Rhu Coigeach and Cromarty, with the grand background, unobscured by mist or thundercloud, of the Cromarty and Assynt Hills, Suilbhein above Loch Inver appearing more dimly in the haze.

After two hours spent on the island, we got into the boat, and our men rowed us round the coast line, a wild sea-bitten craggy shore, with Scart-haunted caves; and at the north promontory of Toll Eilean-a-Chleirach, we saw a very fine sea-arch in the rock. The principle feature in bird life was a fine cormorancy on the north side, in the highest cliffs, which are here about one hundred feet high. I counted about one hundred birds fly off to sea, and reckoned the colony at about one hundred and thirty pairs. Between Cormorants and Shags or Scarts in the caves, I believe there must be at the lowest estimate, five hundred pairs of birds.

Coming south along the east side, we spied a Greylag Goose at sea, and gave chase—a most exciting chevy, indeed, it proved, all the more that fresh meat was a scarce commodity at times at our Iron House. It ended successfully, with the result of adding it to our larder by a successful stroke of the oar blade and gaff handle. It was soon run down, diving shorter each time. If the chase was possibly a little cruel, yet the bird was heavy and fat, and in fine condition, a *sine qua non* with us at the time. It is rarely they are thus seen at sea in this helpless condition: possibly we disturbed the bird on shore in the first instance.

Of sea fish we got few, owing to the thundery air and calm sea; we got six good Lythe, and bought three large pails full of fine Herrings from a fishing smack bound for Little Loch Broom.

The men had a hard row back; we did not land at Gruinard till midnight.

The following is a list of the Birds observed on Priest Island during our visit.

1. Common Sandpiper. One observed.
2. Peregrine Falcon. One pair evidently at home.
3. Great Black-backed Gull. Common.
4. Lesser Black-backed Gull. Common.
5. Herring Gull. Common.
6. Oystercatcher. Common.
7. Starling. A few.
8. Rock Doves. One seen; more abundant in north-west Rosshire.
9. Rock Pipit. Common.
10. Meadow Pipit.
11. Common Thrush. Rare; one or two seen.
12. Cormorant. A colony of about one hundred and thirty pairs.
13. Shag. Say three hundred to four hundred pairs.
14. Razorbill. A few seen in one crevice on the east cliff.
15. Black Guillemot. Common.
16. Wheatear. A few.
17. Greylag Goose. One caught at sea; also on Glaskeir Bheag.
18. Wild Duck. A Drake seen in moulting condition on one of the smaller lakes.

The crushed body of a dead Frog was noticed on the island, probably brought there by some Hooded Crow, or Raven, or Gull.

We may add that our notes on this Island, and on other parts of north-west Rosshire, have been handed over to Mr. J. H. Dickson, who is engaged upon a Topographical Account of the district, which we hope shortly will appear.* It will contain an account of the Natural History of North-west Rosshire.

* This interesting volume has since appeared. The title is "Gairloch, and Guide to Loch Maree" (short title), by John H. Dixon, F.S.A. Scot., Edinburgh Co-operative Printing Company Limited, 1886. It contains also an excellent Map of the district of Gairloch.

IV.

TORTOISES.

By Sir Peter Eade, M.D.

Read 28th September, 1886.

I have almost to apologize for bringing before so learned and critical a Society as this, the few notes and observations I have made upon the "manners and customs" of my pair of common land Tortoises, partly because I feel that much of what I have observed must also have been observed by other members of this Society; and still more because (as is well known) that incomparable master both of observation and expression—White of Selborne—has already noted, and placed upon record, the most interesting of the habits of these creatures.

Mine is thus necessarily a "twice-told tale." I can only hope that the never flagging interest which naturalists take in the observation or record of the habits of animals, will suffice to make them bear with me for the short time I shall detain them.

I have in my garden two of the common land Tortoises (*Testudo Græca*), and these have been in my possession three and four years respectively.

I purchased them from the barrow of a hawker in Norwich streets, in two following years,—one being a little larger than the other, and they are in consequence known by the names of the *old gentleman* and the *young gentleman*.

Although selected as the best from a number of others, I am sorry to say that they both appeared to be ill or greatly injured, and it was a considerable time before they recovered sufficiently either to begin to take food, or to move about with their proper freedom, or with the well-known liveliness of Tortoises!

Another Tortoise, which I purchased, did actually die a short time afterwards, having lived in a state of semi-stupor for the intervening period; and I fear that the capability of these creatures for suffering is not much recognised in the usual methods of their conveyance and treatment.

The two Tortoises which survived have, as I said, now lived on my premises and thriven for three and four years. They have become almost pets. They most evidently recognize the place as their home. They know the various localities of the garden perfectly. They know the sunny spots to which to go at suitable times to bask. They know where to find sun, and where to find this and shade combined, when they so desire it; and they return, afternoon after afternoon, to the same cosy, and dry, and sheltered spots, under the dry ivy of the wall, or elsewhere, which they have often previously selected as their night's abode.

It is very plain that they have some recognition of individuals. For instance, if Lady Eade and myself are both preparing to feed them, they will constantly leave me and walk off to her,—doubtless because she is more in the habit of bringing them their favourite kinds of food than I am.

They appear to be quick of *sight*, but show very little, if any, sign of having any impressions conveyed to them by the sense of *hearing*. They evidently possess a full sense of *taste*, for they discriminate instantly between food they like, and that which is less palatable to them.

The daily *habits* of these creatures are certainly very staid and methodical, and vary but little, except as the season of the year, and the warmth of the day, vary.

They are often, in the height of summer, quite early risers, and on sunny mornings will often be up, and perambulating the garden, and nibbling the little trefoil leaves found amongst the grass, by seven or six o'clock, or even earlier. But, I must say, that these early habits are quite limited to the very finest weather; and it has seemed that in the matter of early activity, these animals always err, if at all, on the side of care and caution. They never leave their beds, or the neighbourhood of cover, if there is the slightest appearance of cloudiness or rain, at least until the day is well up; and for a large portion of their year the time for coming forth is not until eight, nine, or ten o'clock.

In electrical weather they are never lively, even though the day be intermittingly hot and bright; and at such times they are often almost lethargic, and show great indifference as to feeding.

They appear to have an extreme and instinctive objection to rain. Cloudy weather makes them dull. A passing cloud will make them discontinue eating. And the passage of a person or object suddenly between them and the sun will cause them as suddenly to draw in their heads. The dislike of clouds and their accompaniments is therefore a very marked instinct with them.

If not fed, they will go and help themselves, not to grass, but to some white Clover growing with the grass in the garden; or in default of this, to some of the garden plants—by preference the fleshy-leaved ones, such as the Echiveria or Sedum—after which they will retire to some warm place, and bask in the sun. They have a special liking for the warm vine-border in front of my greenhouse; and if the day be not too hot, they will tilt themselves up edgeways against the south wall of the greenhouse, or upon the edge of some tuft of flowers; or if the sun is too warm, they will then cover their heads up with leaves or earth on the bed, leaving their backs uncovered and exposed to the heat. (In this respect they seem to remind us of the habits of the tiger in his jungle.)

But they appear greatly to prefer being fed, and having their food found for them; indeed further, one, at least, much prefers to have his food held up to him, and almost put into his mouth when he opens it.

They take their food with a snapping movement; masticate it little if at all; and when feeding themselves, cut or tear it with the sharp-hooked anterior portion of the upper jaw.

In the hottest weather their appetites are very fine (thus they will eat several large Lettuce leaves at one time), and they bear a close relation to the warmth and clearness of the day, and the period of the year.

Their favourite foods are—beside Trefoil, already mentioned, and garden flowers—Lettuces, Dandelions, French Beans, etc. They are much attracted by yellow blossoms, and greedily eat those of the Dandelion and Buttercup. One of my creatures is very fond of sliced Apple, though the other will not eat it.

But the vegetable of which they are most fond is the Green Pea.

Both of them will leave all other food for this, and they will consume at a meal a very considerable number of these Peas. Indeed, so fond are they of them, that they will follow a person accustomed to feed them with them about the garden, and will even try to clamber up his legs to get at them.

After sleeping and basking, they will again eat, and then again sleep once or twice more during the day; but in cooler or doubtful weather, they usually really eat only once a day, and sometimes not at all.

Although those who hawk Tortoises about the streets will often tell purchasers to put them into their kitchens that they may eat Beetles and Cockroaches, I believe it to be well understood that they are intrinsically vegetable feeders;—a position well put by Frank Buckland, who says that Tortoises put into a kitchen to eat Beetles will in due time die of starvation, and then most probably the Beetles will eat them. Certainly ours never eat anything but vegetable food. But a Tortoise in a neighbouring garden does every morning consume a very substantial quantity of bread and milk, or rather bread well-soaked in milk, and he appears to thrive well upon it. Our Tortoises never drink water, and are decidedly not tempted to drink by milk being offered to them.

Whatever the season, the Tortoises retire very early to bed. The warmth and sunniness of the day appear to regulate the exact time, but they rarely remain up after three or four o'clock, and in the cooler seasons, or on dull days, they retire much earlier.

They will go day after day to the same warm and leafy nook; and they have a habit on rising in the morning of simply turning out of bed, and lying for a time just outside of their bed-place, with their heads stupidly stretched out, or staring vacantly up into the air, before entering upon the serious business of the day.*

I should say their *Memory* is very strong. I have said they remember persons. They remember places they know, and if carried away will march straight off and back again to the place they wish to go to; and what is more remarkable, when brought out in the spring after seven or eight months' hybernation, they do exactly as they did the day before they went to sleep; and will march off as direct to the old spots as if they had only had one day's interregnum.

* It is noticeable how they both do the same thing, in a precisely similar way, at the same time, and this applies even to the attitudes they assume.

As a further instance of memory or intelligent knowledge, we are constantly in the habit, in the cooler weather, of putting them to bed under a mat in the greenhouse; and we very constantly find them, in the morning, waiting by the greenhouse door to be let out, clearly remembering that this is the place by which they will have to pass into the open air.

They do not appear to care much for each other's society—(I believe they are both males),—but they do not fight. Neither are they respecters of each other's persons, for they walk over each other's backs in the most indifferent way, if either happens to be in the direct road of the other's progression.

One of the creatures is certainly fond of climbing. We have several times found him mounted (when shut up in the greenhouse) upon the other's back; or upon an inverted flower-pot; and once we found him in a most pitiable condition through the exercise of these scandent aspirations. He had evidently been endeavouring to climb up some flower sticks placed slantingly against the wall, and in doing this he had turned over upon his axis; and when we found him he was reclining upon his back against these sticks, and standing upon one hind foot, whilst with the other, and with his fore feet, he was making frantic efforts to reinstate himself in a more comfortable position. As so placed he reminded us irresistibly and ludicrously of a huge toad held up by a fore leg.

Our Tortoises have certainly got tempers. They hiss when they are meddled with. They resist and try to scratch, or otherwise hurt, when lifted up from their place of repose; and they exhibit distinct petulance, and will jerk themselves forward out of your hand when you are again placing them upon the ground.

They are also very particular when going to their evening places of repose, and most distinctly refuse to go to rest in the place in which you try to place them, however comfortable this may appear to be, even if they have previously selected this spot for themselves day after day.

Mr. Darwin speaks of a large kind of Tortoise which is reputed to be able to walk at the rate of sixty yards in ten minutes; *i.e.*, three hundred and sixty yards in the hour, or four miles a day. I have twice timed the rate of progress of one of my Tortoises. Once it walked ten feet in the minute, and another time twenty feet in the minute. This latter is at the rate of twelve hundred

feet, or four hundred yards, in the hour; or of a mile in between four and five hours. This truly is not quite the ordinary rate of the hare's progress, but I think they can cross a certain small distance of ground much more rapidly than we should at first suspect.

Once more. These creatures distinctly grow in size from year to year. Our two measure respectively seven and seven and a half inches in length. And they must have elongated fully an inch in the three and four years of our possession.

I weighed them this year, on May 29th, soon after their waking up for the summer, and again on September 8th. They weighed in May, 2 lbs. 7½ ozs. and 2 lbs. 3½ ozs.; a fortnight ago they weighed 2 lbs. 10 ozs. and 2 lbs. 5 ozs.; having thus gained in weight through their summer feeding 2½ ozs. and 1½ ozs. respectively.*

When the due period arrives in which they naturally bury themselves, and so surround themselves with earthen bulwarks, and then retire for the winter into their carapace castles, we put them down into a cupboard in the cellar.

Mr. White remarks that his Tortoise did not bury itself into the ground before November 1st, but ours are cold and torpid, and quite ready to hybernate by the first week in October. Probably the different latitude and longitude of Selborne and Norwich may account for this difference of time.

In this cellar cupboard, the Tortoises remain until the end of April, when, though still dull and stupid, the weather is getting sufficiently warm for them to enjoy the sun for a portion of the day. But the frosts and cold of this period of the year are still dangerous. And a relative of mine lost both of his old friends (who for years had taken care of themselves in the winter in his garden) during the cold weather of this spring, after they had duly survived the far greater cold of the winter in the ground places in which they had buried themselves.

From October to April—fully seven months—they rest from their labours of eating, of breathing, shall I say, of thinking? (or nearly so, for they occasionally stir a little, and are found to have moved a little from under their straw). But they neither eat nor drink, nor see light, nor (I believe) open their eyes. And when

* April, 1887. They have just been again weighed, after their winter's hybernation; and their weight now is, respectively, 2 lbs. 7½ oz. and 2 lbs. 2½ ozs. Thus each of them has lost 2½ ozs. in the seven months of quietude.

touched during this time they feel of a stony coldness, and certainly appear to have none of their faculties in operation.

But with the warmer weather, they again gradually resume the precise habits of the preceding year. Gradually, their bright little eyes resume their intelligence; their memory re-awakens; and they return to the ways, and the habits, and the places of the preceding season, as if their sleep of seven months, were but a single night, and last summer verily but as yesterday.

They are in many respects both curious and remarkable animals. We find them to have enough of intelligence, enough of quaintness, and apparently enough of affection, to give them considerable interest in the eyes of their owners, and to raise them out of the level of despised reptiles. Whilst their remarkable construction, and mysterious power of hybernation, render them specially worthy of study and contemplation.

These specialities and peculiarities must be my much-needed excuse for having troubled you so long with these few details of their personally observed habits and ways.

V.

NOTES ON A FEW NORFOLK PLANTS, INCLUDING FIVE NEWLY FOUND IN THE COUNTY.

By the Rev. E. F. Linton, M.A.

Read 28th September, 1886.

When we speak of the *pale* blue Violets of spring, we call them Dog Violets, as if we had settled them off for a name, without a thought of the varying forms which this scentless ornament of our hedgerows and pastures has assumed. *Viola canina* and *Viola sylvatica* are the two main species; and each has two or more varieties. *V. sylvatica* is, in its more usual form, broad and blue in the petal, pale and furrowed in the spur, and has a squarish prolongation of the sepal at its base, which becomes more obvious

in fruit. This is called *V. Riviniana*, R., and is common everywhere. But there is a much less frequent form, called *V. Reichenbachiana*, Bor., with narrower and paler petals, spur bluer and not furrowed, prolongation at base of sepal small and not increasing in fruit; this I found in August last, in company with the Rev. F. W. Galpin, by whose invitation I was enabled to visit Gawdy Hall Wood, near Harleston, where it grew. I think I also found this form lately in a wood at Beeston St. Andrew; but there was merely a single flower out, and, perhaps because it was a late one, the marks of distinction were not very clear.

Between Dereham and Scarning, I noticed recently three varieties of *Rosa canina*, L., viz.: *R. urbica*, *R. sphaerica*, and *R. tomentella*. Two, if not three of these, are new to that division of the county; though previously reported for the neighbourhood of Norwich. In the same locality, the Rev. W. R. Linton and myself were fortunate enough to come upon two rare species, which, so far as I am aware, have not been reported for Norfolk before.

Epilobium roseum, Schreb., was one of these. It is one of the least common of the Willow-herbs; and I have never been able to find it anywhere previously. It grows in about twenty-seven counties, but very sparsely; and is generally a difficult species to get a specimen of from other botanists. It is known in Essex, but doubtful for Suffolk, and not recorded for any other neighbouring county. Though called *roseum*, the flowers in these specimens were rather pale; this may be from their being nearly the last to come out. The leaves of this species are very distinctive, being stalked and narrowed at both ends. The stigma is entire. The locality is in Norfolk West of Watson's divisions.

The other plant my brother and I discovered that day was *Juncus diffusus*, Hoppe. This too is very scarce, and (till the day before) we had never come across it. Though probably a hybrid, it is so fairly distinct that it is more often than not ranked as a species. It usually grows in very wet meadows where *J. glaucus* and *J. effusus* are found in company. It is usually sterile or nearly so. It most resembles *J. glaucus*, having a finely striate rigid stem; but the capsules are much smaller, the stems rather softer and greener, and the pith is continuous. In *J. glaucus* the pith is remarkably interrupted.

It is rather curious that this Rush, after so long eluding Norfolk

botanists, should turn up within a week in three different places in the county, viz., at Bradfield (near North Walsham) and Beeston St. Andrew in the East division of the county, and near East Dereham in West Norfolk.

For the last two years I have noticed a small form of *Myosotis collina*, Hoffm., which I had ventured to think was the variety *Mittenii*, of the London Catalogue. It is not, however, a well-known plant, and many good botanists have never seen it. In the Report of the Botanical Exchange Club just out, Prof. Babington remarks on my specimens: "They seem to be the true plant. I had not seen it before." I have gathered very nearly the same plant on a sandy common between Thetford and Rushford; and got some excellent examples last May at Dawlish Warren in South Devon.

I mentioned in last year's 'Transactions' that *Potamogeton pusillus* var. *tenuissimus* grew in a ditch between Norwich and Hellesdon. The other day I gathered it between Attlebridge and Alderford. I think there is an unnamed specimen of it in the Salmon Herbarium in this room. The most obvious point of distinction is that the very narrow leaf has only one nerve.

I should like to mention here that the *Juncus nigritellus*, which was mentioned in the 'Transactions' for 1884-85, as found by the Rev. W. R. Linton and myself near Holkham, was *J. nigritellus* of *Don*, not Koch. *Juncus nigritellus*, Koch, is a variety of *J. supinus*, better known now as *J. Kochii*, Syme. Ours was the small variety of *J. lamprocarpus*, Ehrh.

The next plant I have to mention is reported once for the county in Mr. Geldart's list, as occurring near Lynn, on the authority of the Rev. G. Munford. This is the neat-looking sedge, *Carex curta*, Good. It is very plentiful in some mountain districts, and I have gathered it at an elevation of three thousand feet or thereabout both in Perthshire and Forfar. It has a wide distribution, occurring in several of our southern counties; but in East Anglia it is decidedly rare, and for Norfolk well worthy of mention. I found this *Carex* in June of this year by the edge of Barton Broad, on the Barton Turf side. It was only to be seen in one spot; there it was growing, in a quaking morass, suggestive of a mud-bath. There were several tufts of it, so in due time it may help in making a firmer surface.

One more plant remains to be mentioned. *Equisetum limosum*, L., is a Mare's Tail, which grows in muddy ditches and fenny ground. It usually has short rigid branches or no branches at all. But a variety exists which Linnæus recognized, *E. fluviatile*, L., which has long whip-like branches, exceeding the internode, and rather rougher in the upper part of the stem. This variety escaped me in Norfolk till about a month ago, when I found it in plenty in a ditch by the Wensum in Heigham, and soon after in a ditch on the borders of Bradfield and Swafield. There does not appear to be any record of this variety for Norfolk; it is, in fact, rather uncommon.

South Repps Common.—There is a Common near Gunton Station which resembles Beeston Bog in the neighbourhood of Cromer, both in regard to its flowers and its general aspect; but which I do not think is so well known. It is easily accessible from Norwich or Cromer, being near a station on the line. Here are some of its plants:—

Sagina nodosa, Mey.
Trifolium filiforme, L.
Rubus rhamnifolius, W. and N.
Sedum rupestre, Huds. (roadside near).
Parnassia palustris, L.
Apium nodiflorum, Koch. var.
Œnanthe fistulosa, L.
Viburnum opulus, L.
Gentiana campestris, L.
Erythraea centaurium, Pers.
Pedicularis palustris, L.
Mentha sylvestris, L.
Anagallis tenella, L.
Orchis maculata, L.
Orchis latifolia, L.
Gymnadenia conopsea, Br.
Epipactis palustris, Crantz.
Listera ovata, R. Br.
Alisma ranunculoides, L.
Potamogeton polygonifolius, Pourr.
Juncus obtusiflorus, Ehrh.

Scirpus setaceus, L.
Scirpus pauciflorus, Lightf.
Eriophorum augustifolium, Roth.
Carex teretiuscula, Good.
Carex dioica, L.
Carex echinata, Murr.
Carex flava, Linn.
Carex ampullacea, Good.

And within a mile *Mentha arvensis*, var. *præcox*, and *Spiranthes autumnalis*, L., at Bradfield Common, along the same water-course.

VI.

ON THE PERIODICAL MOVEMENTS OF GULLS (*LARIDÆ*) ON THE COAST OF NORFOLK.

By J. H. Gurney, Jun., F.L.S.

Read 30th November, 1886.

The Movements of Gulls in Autumn on the Coast of Norfolk: their constant appearance in small, their occasional appearance in large numbers.

For a long time it has been noticed by people at Cromer, that every autumn great numbers of Gulls pass along the shore, flying west, and many have been the surmises as to the cause of this movement, and the destination of the feathered travellers.

One of the largest flights ever noticed, passed Cromer on October 11th, 1884, and some account of it is given in 'The Zoologist' (1885, p. 174), though I now know from subsequent observation that the estimate of the number seen was over the mark. There had been a gale in the night from N.N.W., and at 11 a.m. not a Gull was to be seen: they began to

appear soon after this, and at 3 p.m., with the wind still west, but greatly moderated, numbers were passing in a westerly direction.

On the 26th of the same month, great numbers were again flying west as before, and as I was very desirous of gaining an accurate notion of their numbers, I stood for exactly two hours on the shore at Overstrand and counted them roughly as they passed. In the first hour, commencing at 3.20 p.m., about four hundred and fifteen passed; in the second, about three hundred and forty-five. They were very close to the shore, and were nearly all in flocks of from ten to twenty each. They consisted of a great many Common Gulls, and a good many Black-backed, chiefly the Lesser Black-backed kind, and there was one Black-headed, and, I think, a good many young Herring Gulls. At half-past five their flocks were still passing as steadily as ever, and every flock took exactly the same course. How long they had been passing, when first seen, it is impossible to say; but probably from early in the morning as the wind had been high, and they doubtless continued passing far into the night. The wind was N.N.W. The next day it was in the same quarter, but there appeared to be no Gulls at all. The following day it shifted to W.N.W., and blew hard, but not so hard as on the 26th. Many Gulls were passing, all going west. Probably from two thousand to three thousand passed, and it may be estimated that five thousand passed west on the 26th.

During the autumn of 1885, no special "passages" of Gulls were noticed at Cromer, which was in part due to my absence in November.

During the autumn of 1886, we had but little west wind, and nothing worthy of mention was seen on the Norfolk coast until the 15th, when Mr. G. Hunt observed flocks of Gulls, amounting in the aggregate to thousands, which continued passing all day over the marshes at Martham, about two miles from the coast. I noted the wind that day as N.N.W., and suppose that these Gulls made the sea at Palling. They probably passed Cromer afterwards, but I was absent that day, and had no information about them. They may, however, have gone straight across Norfolk for the Wash, as Mr. Hunt thinks was the case.

On the 19th the wind was S.W., there having been no west wind on the three intervening days. On that day a great number,

estimated at three thousand, were seen by Mr. O. V. Aplin and his brother, who were staying at Cromer, between that place and Salthouse, going west in flocks, varying from four or five to twenty in a flock.

As regards previous years, similar observations were made at the "Lynn Well" light-vessel, which is in the middle of the Wash, and nearly forty miles from Cromer, by the master on August 21st, 22nd, and 23rd, 1880, and on December 29th, 1881, as given in the "Migration Reports" (1880, p. 61, 1881, p. 36); and at the "Cockle" light-vessel, off Yarmouth, on October 25th, 1883 (1883, p. 54).

Besides, and apart from, the occasional appearance of the great numbers alluded to, there may be seen almost every day throughout October and November, single Gulls, and Gulls in twos and threes, and so invariably is the direction of their flight the same at Cromer, viz., from east to west, as to be a subject of general remark among visitors. The same is the case at Sheringham, according to the information I have received, and I have often observed them at Cley and Blakeney going the same way, viz., from east to west.

As a rule these passing Gulls fly high in fine weather (and sometimes very high), and low in bad weather; but it is a rule which has its exceptions.

Wind the cause of their movements, and also determines their direction.

It is clear these movements of the Gulls are not a "migration" in the accepted sense of the word, because no birds migrate north in the autumn. They are simply local movements, necessitated by the westerly gales in autumn, Gulls always choosing to fly against wind, with very rare exceptions indeed (and those when the wind is moderate). Yet it is perhaps not strictly correct to term them local movements, even using the word "local" in its widest sense. When the wind is due west, it is probable the Gulls gather in the Wash and stop there; but when it is N.N.W. (as on October 11th and 26th, 1884, two of the occasions before alluded to, see pp. 326, 327), it may well be that they cover some hundreds of

miles of ground, for they would naturally follow the east coast as long as the wind lasted.

To show how prevalent westerly winds are with us, it is only necessary to refer to the Meteorological table annually contributed to the pages of our 'Transactions' by Mr. A. W. Preston, in which the direction of the wind is noted from the vane on the spire of Norwich Cathedral. In 1883 we had, in Norfolk, one hundred and seventy-three days of wind from the west, south-west, or north-west; in 1884 we had one hundred and sixty-five; and in 1885 we had one hundred and forty-seven (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 646, iv. pp. 73, 238). The return for 1886 is not published, but I learn from Mr. Preston that the number of days on which there were westerly winds was one hundred and seventy.

The mudflats in the Wash are very extensive, and make a fine harbour of refuge for Gulls; but many of the Gulls which pass Cromer go, apparently, no further than Wells (which is twenty miles), as I gather from the observations of Colonel Feilden, who has at times noted "legions" on the wide "binks" there, doubtless sheltering from a westerly wind, and their natural dislike to flying inland—the only course left open to them if they continue on the wing (Colonel Feilden, *in litt.*).

The mouth of the Humber is another resort. Mr. W. E. Clarke reports that during strong westerly and south-westerly winds he has known numbers to collect in the lower part of the Humber estuary, and that on these occasions there are often, at low water, thousands ashore on "the clays."

He has observed that with a *south-east* wind they go south.

In the same locality, Mr. J. Cordeaux has observed them going south in large numbers against a *south-west* wind (Sixth Report on Migration, p. 65).

They have been seen repeatedly flying against a *due south wind*, as, for example, at Orfordness (Sixth Report on Migration, p. 65), at Flamborough (Fifth Report, p. 54), at Whitby (Fourth Report, p. 45), and at Yarmouth, on October 16th, 1886 (G. Smith, *in litt.*).

But whether it is south, south-east, or south-west, it seems clear that off no part of the east coast of Britain do they fly south

again while the wind comes from the north. That is the chief point of the present argument. When it gets into the south they go south, remaining meanwhile at sea if the wind is not a gale, or in the Wash, the Humber-mouth, or any smaller sheltered estuary.

A few, however, fly inland, and may even cross England to the west coast. As far as I have observed, no Gulls come back past Cromer within sight of land: when their return does take place it is presumedly far out to sea that they fly, when going past Norfolk.*

It is only right to say that both in the Wash and Humber-mouth, an opinion is held (and no doubt in calm weather a correct one) that the Gulls follow Sprats and other fish. In investigating their movements, this must not be lost sight of as a secondary cause. Yet even when food is their object, it may be laid down as a law that the direction of the wind is the key to the movements of all Gulls; though, of course, if there be only a very little wind its effect is *nil*.†

Although a large number of Gulls occasionally pass Cromer with a west wind in comparatively calm weather, it is with a westerly gale that the most remarkable "passages" have been seen to occur. After three or four gales it is easy to see that all the Gulls have passed. No more come up from the south, and their total absence is as noticeable as their abundance was before. The sea-board for many miles, probably extending to the estuary of the Thames, or further, has been denuded of them.

From constant observation I feel sure that Gulls prefer flying against a head-wind to a beam-wind. When they fly against a

* Here the Masters of the Hasborough Light-Vessel, Leman and Ower, and Outer Dowsing, can give the Migration Committee, and others interested in the subject, much more information than they have done hitherto.

† It must be borne in mind that the wind sometimes changes several times in a day; often what seems to be an unaccountable course in a Gull, or other bird, will be found to be merely pursued for the sake of flying against a slight breeze which has sprung up in a fresh quarter—a point which is very easily overlooked by a casual observer.

Again, it does not always follow that the clouds, if they are high, are going in the same direction as the wind at 50 feet from the surface of the sea—the commonest height for Gulls to travel—the reverse is very often the case.

beam-wind it is either a desire to follow the coast line, or to go somewhere to obtain food which makes them do so, and not any preference for that kind of wind, as some have thought.

The different species which pass.

The commonest species to pass in these annually recurring journeys is the Common Gull (*Larus canus*); next in abundance the Herring (*L. argentatus*) and Lesser Black-backed (*L. fuscus*) apparently in about equal quantities, though from the fact that most of them are immature this is difficult to be sure about; next the Greater Black-backed (*L. marinus*); and then, in much smaller numbers, the Black-headed Gull (*L. ridibundus*). It is quite a mystery why so few Black-headed Gulls should pass, for on the whole this is for two-thirds of the year the commonest of the *Laridæ* in Norfolk and Suffolk. Occasionally a few Skuas (*Lestris*) or Glaucous Gulls (*L. glaucus*) are seen, but these are rare near the shore, though I have seen them.

Taking the County of Norfolk as a whole the Black-headed Gull, which so seldom joins the bands of *Laridæ* passing west in autumn, is commoner in summer than in winter, but the number which move south at the latter season is less than in most migratory birds.*

The Common Gull is really our commonest species in winter, but comparatively rare in summer;† while the Herring Gull and Lesser and Greater Black-backed Gulls are commonest in Norfolk in autumn, and are thinly represented in summer.

The absence of Gulls in Spring.

In the spring, when we often have easterly winds, some may occasionally be observed off Cromer, flying east; but the number of Gulls at that season is as nothing compared to what are seen on our Norfolk coast in autumn.

* Mr. Southwell thinks that our Black-headed Gulls move south, after their nesting operations at Scoulton, Hoveton, and Somerton Broads are over; a highly probable conjecture, their place being supplied in winter by migrants from the north.—T. Southwell, *in litt.*

† That the Common Gull should be comparatively rare in summer in Norfolk is probably due to the fact, first clearly proved by Mr. Howard Saunders, of its not breeding south of Scotland, and of its summer range being altogether more northern than the other Gulls.

From March to August, you may spend the whole day on the sea at Cromer, and see no Gulls whatever beyond the five or six which are always to be found at each fishing village where the fishing-boats on the shore indicate that there is something for them to eat. That this should be so is on the whole what is to be expected, yet there are gales in spring as well as in autumn, though less frequently, and the absence of Gulls in February and March is rather singular; but after that date, with the exception of the Black-headed, they have naturally ceased to frequent Norfolk shores.

The reason Gulls hug the shore.

Gulls hug the shore in preference to flying further out at sea, when by so doing they can escape some of the power of the wind. Very often they may be seen so close in that a concealed gunner may obtain as many shots as he requires specimens. They also come nearer in for the sake of cutting off capes and headlands.

At Blakeney I have observed them touch the land opposite to Cley church repeatedly and cross the harbour inside the bar, rejoining the sea-shore further on, thus saving several minutes, and what is more important to them, keeping straight against the wind.

Rate of progress.

A few words in conclusion with regard to their rate of progress. There can hardly be a doubt that the Gulls which passed the "Lynn Well" in August, 1880, and December, 1881 (*vide* p. 328), had a few hours before passed the town of Cromer, which is nearly east of the "Lynn Well," though there is no entry in our Ornithological Diary of my having seen them on any particular day, but the regularity with which they passed during the autumn was noted in 1880 in the 'Zoologist' (p. 510).

It takes Gulls about five minutes to fly a mile against a fresh breeze: therefore the distance between Cromer and the "Lynn Well" would have occupied them about three and a half hours. At the same rate they would pass from the English Channel to the "Lynn Well" in about fourteen hours.

This is a rough calculation, depending of course on the force of the wind. Sometimes a Gull will seem to be absolutely motionless,

but then it is its pleasure to be so. The flocks which pass Cromer in the autumn never stop.

Of course a gale *may be* so tremendous that they cannot live against it, though Gulls can ride out an amount of wind which would be fatal to almost any other bird. In this case birds of all kinds, with a sense of impending danger, fly before the cyclone which the fastest of them cannot outstrip. Mr. A. C. Chapman describes a scene of this kind on October 14th, 1881, on the Northumbrian coast ('The Naturalist,' February, 1886). For three hours he was clinging to a capsized punt, and for ten minutes preceding the storm Gulls and other sea-birds hurried southwards at tremendous speed. He says, "The straggling Gulls and Oystercatchers when overtaken by it simply flopped down into the mud and instantly crouching down headed windwards" (*l.c.*, p. 41).

Though the after result has been occasionally witnessed, *e.g.*, in the case of the Pomatorhine Skua in 1879 and Little Gull in 1870, it is not often that an ornithologist has seen the effect of such a gale at its commencement.

VII.

REMARKS ON SOME NORFOLK EELS.

By Francis Day, C.I.E., F.L.S., F.Z.S.

Read 30th November, 1886.

[The existence in the Norfolk waters of several very marked varieties of fresh-water Eels has long been known, and by some authorities they have been regarded as distinct species. To our Eel-catchers they are perfectly familiar, and are distinguished as the "Silver Belly" (which is seldom or never taken by bait, but on its passage to the sea is intercepted by the Eel-sets, and captured in great numbers); and the "Gloat," "Glut," or broad-nosed Eel,

(a ravenous feeder, but rarely if ever taken in the Eel-sets, and which is non-migratory); these are the best known, but there are other less marked varieties. Both the above-mentioned are females: the first the fertile form, the latter certainly barren, but whether or not permanently so is at present unknown. Another variety may be the male, but this also is uncertain, for I believe so far as is now known, male Eels have only been obtained from brackish waters. Hitherto I have never been successful in obtaining a male specimen, and until very recently they were absolutely unknown.

In the land-locked piece of water known as Saham Mere, are found some Eels of very remarkable appearance, which are known by the natives as "fresh-water congers." One hundred and fifty years ago Blomfield refers to them, and says that from their ugliness the natives very ungallantly call them "old women." As these Eels have never, so far as I am aware, been submitted for examination to any authority, I was very glad in June, 1886, when through the kindness of Mr. Arthur Partridge, of Saham, three specimens were sent to Mr. Stevenson, to have the opportunity of sending them to Mr. Francis Day of Cheltenham, who has very kindly contributed to the Society the report which follows.

It will be observed that Mr. Day does not draw any conclusions from the examination of these singular Eels, for the reason given (want of sufficient material), but it is worthy of note that all the specimens were taken from the same land-locked piece of water of limited extent, and on the same day, and remarkably as they undoubtedly differed from each other externally, it appears almost impossible that three distinct species of Eel should inhabit this Mere, and seems to indicate that the common Eel is subject to very extreme variations, which are either sexual or are induced by the circumstances of their environment.—T. Southwell.]

Having received from Mr. Southwell three Eels in June, 1886, captured in Norfolk, I purpose giving a detailed description of them, showing how they individually differ, and with what published forms they can be identified. I do not propose entering into the question of whether they are local races or distinct species, as for that purpose far more materials are necessary than are at my disposal. I trust, however, at some future date, and after I have

obtained examples from many localities, and also from the trawlers off our coast in the winter months, to be in a better position to give a more authoritative opinion on these points. At present the generality of ichthyologists appear to consider our different forms are varieties of one species; that our fresh-water Eels are mostly females, the males being more commonly present in brackish waters.

Mr. Southwell observed that "the three Eels sent are all from the same locality, and, I think, all differ more or less from the typical Eel of this county. One is a decided specimen of the variety so long known to exist in the pond known as Saham Mere, a piece of water of about thirteen acres in extent; it is not however so strongly marked an individual as I have seen. These Eels are called by the inhabitants 'fresh-water congers,' and they really do somewhat resemble the congers both in colour and form, more especially when alive and in the water."

The three specimens sent differ very considerably one from another, and, following Kaup's divisions, may be described as follows:—

(*a*) Large-eyed species with abbreviated snouts.

1. Anguilla bibroni, Kaup. 'Apodal Fishes,' 1856, p. 33, pl. iii. fig. 16.

(*b*) Anguilla cuvieri, Kaup, *l.c.*, p. 33.

Extreme length	23·3	inches.
Length of body to vent ...	9·5	„
Length of tail	13·8	„
Length of head to gill-opening	2·5	„
Diameter of eye	0·4	„
Eye from end of snout	0·5	„
Eyes apart	0·5	„
Distance from snout to dorsal fin	6·8	„

Body two-thirds as thick as high; the width of the end of the snout 0·30 inches; lips rather thin; the angle of the mouth situated beneath the hind third of the eye: lower jaw a little prominent.

Teeth.—Mandibular band with an *enlarged outer row of about thirteen teeth*, not extending the entire length of the dental portion.

Fins.—In a thick envelope. The dorsal commences 2·7 inches anterior to the vertical from the origin of the anal; height of dorsal

rays to 0·5 of an inch, those a little posterior to origin of anal 0·4 inch. Length of pectoral fin 1·2 inches.

Colours.—Greenish above the lateral-line, silvery white beneath; no distinct black line around the vent.

This form agrees with Kaup's description, except in wanting the black line around the vent, and may be his *A. cuvieri* he described from four examples which came from Sicily. Dr. Günther places this form as pertaining to *A. vulgaris*, with the remark, "Hr. Kaup states that the diameter of the eye is contained only once in the length of the snout; but in the figure the eye is represented exactly as it is in Cuvier's 'Pimperneaux,' the *Anguilla cuvieri* of Kaup." Kaup considered that his *A. cuvieri* did not inhabit England, while an example 18·5 inches long had the diameter of the eye 0·28 inches; whereas in one of *A. bibroni*, 15.54 inches long, it was of similar length. This fish agrees with two out of the three specimens in the British Museum from the Mediterranean, 18 and 19 inches respectively in length, and adverted to in the 'Catalogue of Fishes,' viii. p. 30. The third example is 23·4 inches long, of the *A. latirostris* form, unless there has been a transposition of labels.

2. Anguilla savignyi, Kaup. 'Apodal Fishes,' 1856, p. 34.

Extreme length	19·8	inches.
Length of body to vent ...	8·4	,,
Length of tail	11·4	,,
Length of head to gill-opening	2·5	,,
Diameter of eye	0·4	,,
Eye from end of snout	0·4	,,
Eyes apart	0·4	,,
From snout to dorsal fin ...	5·5	,,

Body two-thirds as thick as high; the width of the end of the snout 0·30 inches; lips rather thin; the angle of the mouth situated beneath the middle of the eye; lower jaw slightly prominent.

Teeth.—Mandibular band with *an enlarged outer row* which do not extend to the symphysis, while the posterior one is slightly curved backwards; they are larger than in *A. bibroni*.

Fins.—The dorsal commences 2·6 inches anterior to the vertical from the origin of the anal. Height of highest dorsal rays 0·8 of an inch; of anal 0·5 of an inch. Length of pectoral fin 1·3 inches.

Colours.—Bronze, shot with green superiorly, muddy-white beneath: the anal fin with a narrow light edge; pectoral variegated with black.

This specimen agrees with Kaup's description of specimens from Naples in the Paris Museum, and which he named as above, and thought might be "a Marine Eel, or one which lives in the mouths of rivers." I have not been able to find any examples of this form in the British Museum Collection; while in the 'Catalogue' it is placed as a synonym to *A. vulgaris*.

(*b*) More elongated snouts and higher dorsals.

3. Anguilla latirostris, Yarrell. 'Proc. Zool. Society,' 1831, pp. 133, 159.

Extreme length	21·0	inches.
Length of body to vent ...	10·0	,,
Length of tail	11·0	,,
Length of head to gill-opening	2·4	,,
Diameter of eye	0·3	,,
Eyes from end of snout ...	0·4	,,
Eyes apart	0·4	,,
From snout to dorsal fin ...	7·0	,,

Body very thick, nearly as wide as high; snout broad; lips thick and well developed; angle of mouth placed beneath the hind third of the eye; lower jaw prominent.

Teeth.—Of uniform size.

Fins.—The dorsal commences 3 inches anterior to the vertical from the origin of the anal. Height of longest dorsal ray 0·6 inch; of longest anal ray 0·5 inch. Length of pectoral fin 0·9 inch.

Colours.—Muddy pea-green superiorly, becoming of a muddy-white below.

Sex.—Female, and apparently sterile.

In this form the cleft of the mouth is not quite so far back, nor the snout quite so broad as is commonly seen in the "broad-nosed" or "glut-eel," with which it generally agrees.

VIII.

ON THE SMELT (*OSMERUS EPERLANUS*) FISHERY IN THE NORFOLK WATERS.

By T. Southwell, F.Z.S.

Read 30th November, 1886.

In nearly all the estuaries and important tidal rivers on the Scotch and English coast at certain seasons of the year is found a delicate little fish called (as some authors assert from the powerful cucumber-like odour which emanates from it when fresh taken) the Smelt. Although nowhere of such importance as to figure largely in the fisheries returns, for very many years a successful, and frequently a very remunerative Smelt fishery, has been prosecuted in the Norfolk waters, and I doubt not in many other suitable localities. As I do not remember to have met with more than passing allusions to this industry in the works which treat on such subjects, I have thought it might be interesting to record such information as by personal observations, and through the kindness of various correspondents, I have been able to collect with regard to the Smelt Fishery in the county of Norfolk.

The great estuary of the Wash has always been noted for the abundance of this fish taken in its shallows, and in the rivers which discharge themselves into its intricate channels. Of these, the Ouse is the most important, and a very ancient Smelt fishery is known to have been prosecuted in the portion of that river between Wiggenhall St. Germans and the town of Lynn, a distance of some seven miles. In a footnote to a curious old poem entitled the "Life of a Fen-man," published at Lynn in 1771, it is stated that large quantities of Smelts come up the river Ouse to spawn, and are caught by the Fen-men, who make a considerable profit,

"a single share in this fishery having been known to produce £50." It is probable that much larger quantities are taken now. Dr. Lowe informs me that in the river they are caught in considerable quantities in "stow-nets" between St. Germans and Lynn as they descend from the spawning grounds, at that time, of course, they are watery and insipid, and utterly unfit for food. The same authority also tells me that enormous quantities of these fish are captured in the drains and cuts of the Bedford Level, up which they make their way to spawn. They are caught by draw-nets, and occasionally some tons of fish are secured at once. Some of these contain roe, others are shotten. They are disposed of chiefly in the neighbouring towns and villages. In the river Ouse itself, near Lynn, very large numbers of young Smelts are taken in "stow-nets" set for bait; as these nets are in constant use, the destruction, although unintentional, must be very great, and this practice, as also the wholesale capture on the spawning-ground, ought, if possible, to be stopped. Below the town of Lynn, many Smelts are taken in stake-nets set in the tidal shallows, and this is, of course, a perfectly legitimate fishery. The season for taking these fish in the river Ouse, and its tributaries, is from 1st September to 31st March, and the mesh of the nets used is restricted by the Bye Laws of the Norfolk and Suffolk Fisheries Act (1877) to five-eights of an inch from knot to knot, measured when wet.

Sir Thomas Browne speaks of the great plenty of Smelts, or, as he calls them, "Spirinches," about Lynn; also of "a small fish, called a Priame, answering in taste and shape a Smelt, and perhaps are but the younger sort thereof," rendering it probable that even in the second half of the seventeenth century, the same wasteful practice of taking the immature fish on their way down to the sea, prevailed as at present.

At both Yarmouth and Lowestoft large quantities of Smelts are taken annually. In the autumn, occasionally good sport may be had angling from the piers and in the harbours, Shrimps being generally used as bait; but the greater number at the latter place are taken in the waters above the town as high as Mutford Lock. At certain states of the tide, that is about the last hour and a half of the flood, and the first hour of ebb, Smelts are often taken by the drag-net in the sea at Gorleston; but the great fishery is in the shallows and creeks of Breydon.

Even here the smelting is carried on in a desultory sort of way, as a rule, by men of no fixed occupation—Gunners, Eel Pickers, Marshmen, and perhaps Poachers. The season is from 1st September to the 30th April, and the net used is a "draw-net" made of fine cotton or thread, some fifteen or twenty yards in length, the prescribed mesh being five-eighths of an inch. These nets are beautifully got up, and cost, I am informed, from 70s. to 90s. each.

The number of boats and men employed here is very uncertain, depending in a great measure upon whether Smelts are plentiful or otherwise. It is probable, however, that there are not more than ten or twelve boats, each carrying three men, which make a business of smelting, and then, as before said, it is only worked conjointly with some other description of fishing or gunning.

The fishing extends a short distance up the Waveney to the Burgh Castle Cement Works; very little is done in the North River or Bure. Above the Burgh Cement Works, Smelts are not allowed to be taken except by cast-nets between the 10th March and the 12th May, and the same bye-law applies to the rivers Yare and Wensum. The take of Smelts is greatly influenced by the weather, a long continuance of fine weather being very favourable to the fishermen, three or four score at a fishing is considered a fair catch; but under exceptionally favourable circumstances ten score have been known to be taken. The bulk of the Smelts caught on Breydon, I am informed, find their way to Norwich and Cambridge, especially to the latter town, and very few are consumed at Yarmouth, unless the catches are large, and the fish exceptionally cheap. I have to thank Mr. W. J. Nutman, of Yarmouth, for much information with regard to the Breydon Smelt Fishery.

We are apt to arrogate to ourselves greater wisdom in regulating our fisheries than we are inclined to accord to our forefathers. In this, I think, we are unjust, as can be shown by many ancient documents. I have now before me a copy of a set of "Regulations made for the Fresh-water Fishermen" of the river Yare, in the reign of Philip and Mary (1553—58), which might have served as a model for our own conservators. Mr. Day has pointed out that a mesh was legalised for taking Smelts as early as the reign of Elizabeth (1558—1603), and an Act passed in the thirty-third

year of George II. (1760) renders it penal to take or possess "any Smelt not five inches long." There can be no doubt that the wise regulations under the Norfolk and Suffolk Fisheries Act of 1877 have proved very beneficial to the fisheries of the waters coming within the jurisdiction of the Act; but if we have no longer to send the bellman round, as was the case in 1667, to prohibit the taking of "any Salmons from the Nativity of our Lady to St. Martin's day," the change is not so much due to "the ancients" as to our more immediate ancestors, who suffered the free course of our rivers to be impeded by mills, and their waters to be polluted by sewage and refuse, thereby bringing about a state of things, the significance of which is more obvious than its remedy. Yet, in spite of all this, through sewage, dye refuse, and polution of every description, year after year, the Smelts continue their vain efforts to ascend the Wensum to deposit their spawn, and till actually stopped by the so called "New Mills" (erected in 1430), on the far side of the city, in spite of the obstacles named, they persistently pursue their course. In the pool of the New Mills, of course, they are stopped, and there from the 10th of March to the 12th of May a fishery is actively prosecuted, which for singularity and picturesqueness is perhaps unequalled in the thickly populated portion of any other city in England.

Doubtless all present are well acquainted with the course of the river Wensum from the New Mills downwards to Water Lane, St. James', a distance of more than a mile. On either side of the water rise buildings, more picturesque than beautiful, bordering the stream by a solid wall on each side, the line only broken by an occasional wharf, or by alleys which lead from the adjacent streets down to the water side, the outlet of these side approaches either ending in a brick quay-side, sufficiently elevated to protect the adjacent premises from the influx of the tide at high water, or in a gangway rapidly sloped to the water's edge; the buildings themselves are in every imaginable style, and in all states of preservation, from the stately well-kept brewery, to the tumble-down hovel, with its rickety flight of steps descending to the water's edge, the sombre looking dye works, indigo stained, or the lofty walls of dwelling-houses, pierced by windows overlooking the waters, and crowned by long rows of peaked gables; the whole, if

not presenting the *beauty* of a Venetian Canal, certainly displaying all the quaintness and variety of its Dutch equivalent, and confining the black waters, in their sluggish course, between barriers of solid brick work, here in light, there in shade, but everywhere quaint and picturesque.

Let the spectator, some dark blustry March night, place himself on the New Mill Bridge, and look down stream into the rushing mill-pool. Moored along the river on either side, he will see a dozen or more boats, each burning a flare over its side, bringing a portion of the boat into bright light, and increasing the blackness of the surrounding darkness; standing upright in the boat is a man curiously attired in waterproofs, often of the roughest description, slowly he gathers up some object, half-seen in the partial illumination, and with a sudden turn and a jerk, casts it from him into the water; the sound of the splash is lost in the noise of the rushing flood, but the light shows a circle of broken water where the mysterious object has sunk; now he is slowly and carefully recovering the something from the seething tide, and after placing it in the boat, both he and his companion are seen bending over their treasure. The same thing goes on from the whole of the boats, repeated at short intervals, and the whole scene, from the irregular outline of the buildings sharp cut against the fleeting clouds above, to the dark abyss below lighted by the flaring torches, accompanied by the loud rush of the rapid mill-stream forms a picture weird in the extreme, and not soon to be forgotten.

These men which we have just seen are smelting, and there they will stand, should fish be plentiful, from dark to dawn, patiently swinging their great casting nets into the water, as Mr. Lubbock justly says, "the personification of patience." "Hour after hour," says the same author, "does he persevere, moored exactly in the same spot, with a torch attached to the side of his broad flat-bottomed boat, flinging his immense casting-net, dropping the near side of it, at each throw, within three inches of the torch. One fortunate cast, if smelts sell well, may recompense him for hours of fatigue, wet, and cold; and he waits, like the loosing gambler, for the lucky throw which is to brighten his fortunes."

The Smelt Fishery in the rivers Yare and Wensum, which form a junction at Trowse Hythe, some little distance below the city, and are from thence to the sea known as the Yare, is almost

entirely confined to the New Mills Pool and Trowse Hythe; the season is from March 10th to May 12th, both days inclusive; only a cast-net is allowed to be used, and the size of the net is restricted to sixteen feet in diameter. The same rule applies to the river Waveney above the Burgh Cement Works before mentioned. The largest catches are generally taken in the New Mills Pool, where the fish congregate, not being able to proceed further up the river. Mr. Lubbock says, that formerly, twenty-five or even thirty score have been taken by one net in a single night; but I have heard of no such catches of late; five or six score being considered a good night's work. As the fish swim in "schools," a single well-directed throw may be very remunerative.

The price varies exceedingly according to season and supply, but they average about 2s. 3d. per score. Many years ago I have bought these fish at Lynn for the odd 3d. per score; and at times, when a catch has been brought in, the air in the neighbourhood of the fishmongers' shops has been permeated with the peculiar odour which emanates from the freshly caught fish; but I cannot say it has ever been my experience to meet with such numbers "that it was easy to detect the peculiar cucumber smell which distinguishes them, by walking along the river side," as stated on the authority of a correspondent of Hardwick's 'Science Gossip' in Day's 'Fishes.' That this smell has a protective virtue for the Smelt there is little doubt, as other fish refuse them as bait, and are said to forsake the waters where the Smelts are spawning.

It is perhaps for that reason that few other fish are taken by the Smelters, although Roach, Perch, Ruff, Dace, Gudgeon, or even Trout, occasionally come up in the net.

Fabulous stories are told as to the size of some of the Smelts which have been taken, they certainly do vary very much, the largest I have seen was taken at the New Mills, and measures eleven inches in length. The late Mr. Norman saw one at Yarmouth measuring eleven and a half inches in length, and weighing seven ounces. Dr. Lowe has seen Smelts of exactly the same size and weight from the Ouse, these were full of roe; but another, which he saw, measured twelve inches in length, and weighed only a quarter of a pound. The usual length is from six to nine inches measured to the fork of the caudal fin.

IX.

ON THE ZOOLOGY OF CAPTAIN MARKHAM'S VOYAGE TO HUDSON'S BAY IN THE SUMMER OF 1886.

By Lieut.-Colonel H. W. Feilden, C.M.Z.S., F.G.S.

Read 25th January, 1887.

Captain Albert Markham, R.N., having kindly placed in my hands the Journal of his Voyage to Hudson's Bay in the summer of 1886, with his permission, I have the pleasure to lay before the Society the following notes on the animal life met with in that region. Mr. H. D. Geldart has kindly undertaken to report upon the Botany.

Captain Markham left England in the beginning of June, 1886, for Halifax, to join the "Alert," which was about to be despatched by the Canadian Government to visit and relieve the various Meteorological Stations in Hudson's Bay. The "Alert," a vessel of historic interest in connection with British and American Arctic Voyages, had been presented by the United States Government to Canada, and now sails under the Dominion flag, and is commanded by Mr. A. B. Gordon, who is an Assistant to the Toronto Meteorological Society, and a retired Lieutenant of the Royal Navy.

On the 14th of June the "Alert" started from Halifax on her cruise, and passing through the Straits of Belleisle, steamed northward along the coast of Labrador. The first three days of the voyage were rather dreary, as a thick fog surrounded them the whole time; it then cleared, and on the 2nd of July the first ice was met, consisting of loose streams of rubbly ice, mostly composed of fragmentary portions of icebergs, that were being gradually broken up by the action of waves and weather; but it offered no hindrance to the progress of the "Alert." The next day they

were passing through loose streams of pack-ice, and saw some large icebergs, several must have been two hundred feet in height, and were probably offshoots from the great glaciers of Baffin Bay, that had drifted down through Davis Straits. On July 4th they were off Nachvak, where there is a Hudson Bay establishment, and an attempt was made to communicate, in order to leave letters, but the ice for a width of ten miles off the coast was found to be so closely packed as to make the attempt useless. Numbers of Walrus were there seen; the ice was found to extend to a distance of some sixty or seventy miles from the coast. On July 5th the "Alert" reached the entrance to Hudson Bay, but unfortunately the weather was so thick with fog and snow that the position of the vessel could not be ascertained either by astronomical observation or bearings of the land, and at the same time she was surrounded by loose ice. This state of affairs lasted until the 8th of July, when, during a partial clearance, land was sighted about a mile off, which was identified as a headland of Eclipse Harbour on the coast of Labrador, and it was found that during the past three days the ship had drifted some sixty miles to the southward. During that whole time the "Alert" was surrounded by loose ice; this packed and loosened at intervals according to the action of the tides.

On the morning of the 9th of July a bearing of Cape Chudleigh was at length obtained, and by noon of the same day, the ship was once again at the entrance to the Straits, at which time not a particle of ice was visible. On the morning of the 11th of July, the Savage Islands were reached. The "Alert" anchored for a couple of hours at Ashe Inlet, and on the morning of the 11th of July shaped a course to the westward, finding much ice, but not too closely packed to oppose the ship's progress entirely, though on rare occasions it was retarded; large floes of ice about half a mile in length were seen.

On July the 20th the Meteorological Station on Western Digges Island was reached (the Laperriere group), and the "Alert" remained there until the 25th of July, being detained for three days longer than was intended by the ice setting in, and packing across the mouth of the harbour.

After leaving Digges Islands, some tightly packed ice was met with; but in twenty-four hours' time, and within seven miles of

Digges Islands, the open water of Hudson's Bay was reached; after which but little ice was seen. The "Alert" then passed between Mansfield and Southampton Islands, and a course was shaped for Fort Churchill, which was reached on the 29th of July. This is a fine harbour, about two miles across, with very good anchorage; a survey of the harbour was made. The ship then proceeded to York Factory, which was reached on August 5th. Captain Markham there landed, and with canoes and Indians made a start for Oxford House, which he reached on the 21st of August; leaving Oxford House on the 30th of August, with the Indians, he reached Winnipeg on the 12th of September, 1886.

Mammalia.

Canis lupus. The Wolf.

A few were observed in the neighbourhood of Ashe Inlet by the meteorological observers stationed there. Some half-dozen skins were obtained from the Eskimos. A whelp was brought in alive to the station by the natives; it was doing well under the influence of domestication. When seen by Captain Markham it was about two months old, and of a yellowish colour, and was about eighteen inches in height. Time and circumstances did not admit of any exact measurements being taken.

Canis familiaris. Eskimo Dog.

The Dogs used by the Eskimos in Hudson's Straits resemble in every respect those found in Greenland and other parts of the Arctic regions. Two examined at Ashe Inlet appeared to be somewhat smaller than the usual run of Greenland Dogs, but they were acknowledged to be below the average in size.

Ursus maritimus. Polar Bear.

Ten of these were seen, and eight obtained by members of the expedition. Those first shot were in very poor condition, their stomachs being nearly empty—one entirely so. The White Bear may be called common in all parts of the Straits.

Rangifer tarandus. Reindeer.

Reported to be numerous in the neighbourhood of Ashe Inlet. So plentiful was the supply of venison brought to the station by the natives, that it appeared nearly daily on the table of the Observers, who, however, were dependent on the Eskimos for it.

No Reindeer were actually seen alive by any of the Observers attached to the station at Ashe Inlet. Venison was also brought by the Eskimos from Cape Wolstenholme to the station at Digges Island.

LEPUS GLACIALIS. Alpine Hare.

Is not uncommon in the neighbourhood of Ashe Inlet. Large numbers were shot on Rabbit Island. No Hares were seen on Digges Islands.

MYODES TORQUATUS. The Greenland Lemming.

One of these little animals was taken at Ashe Inlet. Captain Markham captured another on Digges Islands. At neither locality did they appear to be common. These specimens were sent to the British Museum. This is the same species that was found in such abundance in Grinnell Land, twenty degrees further north, by the British Polar Expedition in 1875 and 1876.

DELPHINAPTERUS LEUCAS. White Whale.

When Captain Markham arrived at Fort Churchill in the end of July, considerable numbers of these animals were being captured by the natives, and many carcases of these Whales were lying about the shore.

BALÆNA MYSTICETUS. Atlantic Right Whale.

A "Right Whale" was seen by Captain Bamie on the morning of the 10th of July, shortly after the "Alert" entered Hudson's Straits.

BALÆNOPTERA ——— (?). Finner.

Two or three of these animals were seen off the coast of Labrador, but they were not specifically identified.

MONODON MONOCEROS. Narwhal.

Five Narwhals were seen together in the afternoon of July 11th in the centre of Hudson's Straits.

TRICHECHUS ROSMARUS. Walrus.

Many of these animals were seen in groups of three to seven on the loose ice in the latitude of Nachwak. Two were observed by Captain Bamie in Hudson's Straits on the 10th of July, and one was killed at Ashe Inlet the day prior to the arrival of the "Alert." They are plentiful in the neighbourhood of Digges Islands.

Phocidæ.

Captain Markham did not arrive at a definite conclusion as to how many species of Seals inhabit the waters of Hudson's Straits. *Phoca grœnlandica* and *Phoca fœtida* were recognised. Seals were not seen in any great numbers, and generally only single specimens at a time.

Obs.

Mr. Tyrrell obtained at Ashe Inlet the skin of an animal which from his description must have been the Ermine. It was killed in the neighbourhood by an Eskimo.

Aves.

Turdus migratorius. American Robin.

Found breeding in the vicinity of York Factory by Captain Markham.

Anthus ludovicianus. American Titlark.

A single example of this species was shot and secured by Captain Markham at the Digges Islands on the 26th of July, 1886. This specimen is now in the collection of Messrs. Feilden and Harvie-Brown.

Pinicola enucleator. Pine Grosbeak.

A beautiful specimen obtained near York Factory. (In Mus. F. and H.-B.)

Plectrophanes nivalis. Snow Bunting.

Noted as very common on Digges Islands, where they were breeding.

Pica rustica (hudsonica). Hudson Bay Magpie.

A specimen procured at York Factory. (In Mus. F. and H.-B.)

Corvus corax. Raven.

These birds were seen by Mr. Tyrrell, near the Observatory at Ashe Inlet, during 1886, but not by Captain Markham.

Picoides arcticus. Arctic Three-toed Woodpecker.

A single specimen obtained near York Factory by Captain Markham, in August, 1886. (In Mus. F. and H.-B.)

Colaptes auratus. Golden-winged Woodpecker.

Captain Markham obtained this species near York Factory, where he found it breeding, and secured the bird with its eggs. (In Mus. F. and H.-B.)

NYCTALA RICHARDSONI. Sparrow Owl.

Obtained near York Factory. (In Mus. F. and H.-B.)

BUBO VIRGINIANUS (ARCTICUS). Arctic Horned Owl.

A magnificent example obtained near York Factory. (In Mus. F. and H.-B.)

ACCIPITER FUSCUS. Sharp-shinned Hawk.

A single example obtained by Captain Markham, in the vicinity of York Factory, August, 1886. (In Mus. F. and H.-B.)

FALCO CANDICANS. Greenland Falcon.

Four of these birds were observed by Captain Markham at the Digges Islands. One was shot and brought on board the "Alert," it was in the speckled stage of plumage—white and black. On the 23rd of July, 1886, Captain Markham discovered an eyrie of this species on West Digges Island: it was placed in what proved to be an inaccessible spot on the face of a cliff. There were four young ones in the nest: by throwing stones from above, two of the young ones were knocked out of the nest and killed. (In Mus. F. and H.-B.)

FALCO PEREGRINUS. Peregrine Falcon (?).

Captain Markham is of opinion that he saw a bird of this species at Digges Island, but at too great a distance to satisfactorily identify it.

BERNICLA BRENTA. Brent Goose.

Were reported as plentiful on Digges Islands during the spring migration of 1886, when several were shot by the Observers at the Meteorological Station.

CYGNUS ——— (?). Wild Swan.

Four or five Wild Swans were seen to alight on Digges Islands during the spring of 1886, but no specimen was secured.

HARELDA GLACIALIS. Long-tailed Duck.

Was found breeding near Ashe Inlet by the Members of the Meteorological Station. A female was shot on Digges Islands. Not common as a species in Hudson's Strait.

SOMATERIA MOLLISSIMA. Eider Duck.

Captain Markham saw four of these birds at Ashe Inlet, where he was informed they bred. He also saw examples at Digges Islands.

Somateria spectabilis. King Eider.

Captain Markham was shown the skin of one of these birds that had been shot at Digges Islands.

Lagopus rupestris. Rock-Ptarmigan.

Distributed on both sides of Hudson's Strait, and apparently very plentiful. One captured on West Digges Island had been confined in a cage for six weeks when seen by Captain Markham, and it appeared to thrive very well.

Ægialitis semipalmata. American Ringed Plover.

Several specimens of this species were obtained on West Digges Island. Captain Markham obtained a nestling in down, which is not distinguishable from young of the same age of *Ægialitis hiaticula*. (In Mus. F. and H.-B.)

Tringa bonapartii. Bonaparte's Sandpiper.

Captain Markham's Collection contains two specimens of this bird, which were shot by him on West Digges Island in July. They were found along the shore in flocks of from six to ten. In all probability they breed there. (In Mus. F. and H.-B.)

Tringa striata. Purple Sandpiper.

A single example shot on West Digges Island, but being killed by a rifle bullet was much mutilated. Sufficient was brought back to identify the species.

Phalaropus hyperboreus. Red-necked Phalarope.

Two flocks of these interesting little birds were observed by Captain Markham feeding on the water, one off the coast of Labrador in about the latitude of Eclipse Harbour, the other inside of Hudson's Straits. Captain Markham also saw a single example off the shore of West Digges Island.

Phalaropus fulicarius. Grey Phalarope.

Two specimens were obtained at West Digges Island. Captain Markham was informed by one of the "station-hands" that he had seen the nest of this bird, which he called a Knot! On the 23rd of July, Captain Markham found a nest of the Grey Phalarope containing four eggs; the nest was not regularly built, but simply a hole, lined with a few blades of grass, in some marshy land in the neighbourhood of a large pond.

PAGOPHILA EBURNEA. Ivory Gull.

Captain Markham writes: "One bird which I took to be an Ivory Gull was seen by me in the ice off Nachvak. It was however, too far off for me to be positive regarding its identity, but I am nearly certain of it. Saw four birds at Digges Islands, which I took to be Ivory Gulls, but they were too far off for complete identification."

RISSA TRIDACTYLA. Kittiwake.

Called by the Newfoundland fishermen "Ticklass," was observed off the coast of Labrador, but none were seen by Captain Markham after entering Hudson's Strait.

LARUS DELAWARENSIS. Ring-billed Gull.

A specimen obtained at Ashe Inlet, Savage Islands, is included in the collection brought back by Captain Markham. (In Mus. F. and H.-B.)

LARUS GLAUCUS. Glaucous Gull.

The "Burgomaster" was seen several times inside of Hudson's Strait, but invariably as single specimens.

LARUS LEUCOPTERUS. Iceland Gull.

These birds were found breeding in the neighbourhood of the Digges Islands, but not in great numbers. A specimen was obtained, but not brought to England.

XEMA SABINII. Sabine's Gull.

A beautiful specimen in full breeding plumage, obtained by Captain Markham, near York Factory. (In Mus. F. and H.-B.)

STERCORARIUS POMATARHINUS. Pomatorhine Skua.

One example seen by Captain Markham in Hudson's Strait to the westward of North Bluff.

STERCORARIUS PARASITICUS. Long-tailed Skua.

Several seen in Hudson's Strait, and always in pairs.

COLYMBUS SEPTENTRIONALIS. Red-throated Diver.

A single example seen at Ashe Inlet, where it breeds. It also breeds on the Digges Islands. Captain Markham obtained a nestling at West Digges Island, one of a pair hatched out from under a hen. (In Mus. F. and H.-B.)

Fulmarus glacialis. Fulmar.

Captain Markham writes: "The Mollie of the whalers, the Noddy of the Newfoundland fishermen, was our constant attendant along the coast of Labrador and in Hudson's Strait, more especially after a Bear had been killed. Their attendance however was erratic, and they frequently absented themselves from the ship for days at a time. None were seen in Hudson's Bay after we had passed one hundred miles west of North Bluff."

Podiceps auritus. Sclavonian Grebe.

Two specimens were obtained by Captain Markham at York Factory. They are in full breeding plumage. (In Mus. F. and H.-B.)

Alca arra. Brünnich's Guillemot.

These birds were constantly seen northwards from the Straits of Belleisle. Loomeries, or breeding places, where these birds congregate in incredible numbers are said to exist on Resolution Island and on the Digges Islands.

Uria grylle. Black Guillemot.

The Dovekie of our Arctic voyagers, the Sea-Pigeon of the Newfoundland fishermen, was observed on the passage northward off the coast of Labrador, but they were seen but rarely in Hudson's Straits.

Fratercula arctica. Puffin.

Seen in great numbers in the Straits of Belleisle, but none were observed further north.

Pisces.

Only three species of fish were brought home by Captain Markham; they were kindly identified by Dr. Günther, F.R.S.

Gastrosteus pungitius, L. Stickleback.

Found in some numbers in a fresh-water pond on West Digges Island.

Cottus scorpioides, Fabr. Miller's Thumb.

Taken near the shore of West Digges Island.

Centronotus fasciatus, Bl. Butterfish.

Taken from the sea, in the vicinity of Fort Churchill, Hudson's Bay.

[In drawing up this short paper chiefly embodying extracts from Captain Markham's Journal, I have omitted any reference to his notes made during his journey from York Factory to Winnipeg; because, travelling rapidly in canoes with the Indians, it was impossible for him to secure, or always to satisfactorily identify the species met with; moreover, it would be at the best a mere fragmentary addition to our acquaintance with the Fauna Boreali Americana. I have introduced into the list the species obtained by Captain Markham at Fort Churchill and York Factory, and of which he gave me specimens, more to indicate the continental character of the Fauna of the western coast of Hudson's Bay, in comparison with the truly Arctic Fauna of Hudson's Straits. At York Factory we find the Yellow-winged Woodpecker and the American Robin breeding; at the Savage and Digges Islands, at the eastern entrance of Hudson's Bay, we meet with a Fauna and Flora almost identical with that of Grinnell Land, twelve hundred miles nearer to the North Pole, whilst we must remember that Hudson's Strait lies in the same parallels of latitude as the Shetland and Faeroe Islands, with their temperate climate. The striking difference in temperature between these places, situated in the same latitudes, is entirely due to the present distribution of land surfaces and the set of the Arctic currents. I will not dilate further on this topic, which is one that I have on previous occasions submitted to this Society, but refer to the facts as being of great interest in connection with the causes which in a late geological period induced similar glacial conditions with an Arctic Fauna and Flora in Great Britain. Our thanks are due to Captain Markham for having placed this interesting Journal and Collections at our disposal. During all his voyages, and in the midst of professional duties, Captain Markham has invariably interested himself in the cause of science, and his diligence in collecting objects of natural history, and care in recording observations, is equalled by his readiness to impart the information thus obtained to others.—H. W. F.]

X.

NOTES ON PLANTS COLLECTED BY CAPTAIN MARKHAM, R.N., AT FORT CHURCHILL, HUDSON'S BAY, AND WEST DIGGES ISLAND, HUDSON'S STRAITS, IN JULY AND AUGUST, 1886.

By Herbert D. Geldart.

Read 25th January, 1887.

The two small herbaria collected by Captain Markham, R.N., which Colonel Feilden has kindly allowed me to describe, come, one from West Digges Island in Hudson's Straits, lat. 62·34, N., long. 78 W., collected on 21st July; and the other from Fort Churchill, on the shores of Hudson's Bay, collected on 1st August, 1886. As the latter, merely a slice from the flora of the Mainland of Eastern North America, a small fraction of a very large flora, is for that reason the least interesting, we will take it first.

This collection contains about thirty-eight species, five of which are quite too imperfectly represented for determination. Some of these species are very interesting; among them are *Hedysarum mackenzii*, a magnificent purple vetch; *Dryas drummondi*, with its shock-head of feathery achenes; *Saxifraga hirculus*, with golden flowers as large as a shilling, on stems six inches high; *Saxifraga tricuspidata*, four or five inches high. *Epilobium latifolium* has splendid mauve-coloured flowers; *Cineraria congesta* is a dwarf compressed form of our Norfolk rarity *Cineraria palustris*. The lovely little *Primula* (*Misstassinica*) *stricta* is a condensed epitome of the British *Primula farinosa*. *Pyrola rotundifolia* has dense compact heads of flowers three or four inches in height; there is also one fern not easily to be distinguished from the British *Lastrea spinulosa*. I specify these species particularly, for to

several of them I shall have to refer again, as showing by their condition the difference between the vegetation of the somewhat more sheltered and warmer Mainland, and that of the bleak storm-swept and terribly cold Island clasped in the ice of the Straits.

The peculiarity which most strikes one in examining this collection is the enormous proportion of berry-bearing plants to the total number; out of thirty-eight species there are no less than six which would bear berries of sufficient size and quality to help largely in the support of man and animals; these are a Strawberry, a Raspberry, two Gooseberries, a Bilberry, and an Arbutus. Berry-bearing seems a special attribute of the plants of the North East American Hudson's Bay Territory. John Davis found "red fruit growing on the rocks, sweet, and full of red juice, and the ripe ones like corinths;" and McLean enumerates Blueberry, Cranberry, Gooseberry, Currant, Strawberry, and two Raspberries (*Rubus Chamæmorus* and *R. arcticus*) as plentiful. Hearn says, "Gooseberries spread along the ground like vines. Cranberries grow in great abundance near Churchill. Dewater Berries [as he calls them—perhaps the fruit of *Rubus Chamæmorus*], ripe in August, something like strawberries, wholesome and anti-scorbutic. Currants, both red and black. Juniper Berries, called by the Indians Crowberries. Strawberries of considerable size and very good flavour, as far north as Churchill River, particularly in places which have been burnt. Heathberries [whatever they may be] so plentiful that in some years you cannot walk without treading on them, near Churchill. Eyeberries, Partridge berries, and 'Hips,' very plentiful, and of various sizes." Thus, fruit might form a large item in the summer food of the inhabitants of Churchill. We shall find matters changed when we come to consider the "Island" flora from this point of view. Altogether the look of the specimens from Churchill indicates a fairly fertile soil, and no such excessive degree of Winter cold as to interfere prejudicially with herbaceous vegetation, though we find from Hearn's account that the forest Trees are very few indeed; Pine, Juniper, small scraggy Poplar, creeping Birch, and dwarf Willows; but further west, in the Athabasca country (same latitude) the Pines, Larch, Poplar, and Birch Trees grow to a great size, the Alder also grows there.

I find — 45° F. quoted as a very exceptional winter temperature at Churchill, the lowest for many years.

The following is a complete list of the species identified in this collection :—

Draba alpina, L.
Honckenya peploides, Ehr.
Stellaria longipes, Goldie.
Oxytropis campestris, D. C.
Astragalus alpinus, L.
Hedysarum mackenzii, Rich.
Dryas integrifolia, Cham. and Schlect.
Dryas drummondi, Hook.
Fragaria virginiana, Ehrh.
Potentilla (Scrap).
Potentilla anserina, L.
Rubus chamæmorus, L.
Saxifraga hirculus, L.
Saxifraga tricuspidata, Retz.
Parnassia palustris, L.
Ribes } Too poor to name.
Ribes }
Epilobium augustifolium, L.
Epilobium latifolium, L.
Taraxacum officinale, D. C.
Achillea millefolium, L.
Solidago virgaurea, L.
Cineraria congesta, Hook.
Arnica angustifolia, Vahl.
Chrysanthemum arcticum, L.
Primula (misstassinica) stricta.
Pyrola rotundifolia, L.
Vaccinium uliginosum, L.
Arctostaphylos alpina, L.
Pinguicula vulgaris, L.
Bartsia alpina, L.
Castilleia pallida, Kunth.
Pedicularis (Scrap).
Polygonum viviparum, L.
Eriophorum scheuchzeri, Hoppe.
Aira. Too poor to name.
Poa laxa, Hœnke.
Lastrea spinulosa, Presl.

The Digges Islands lying on the southern side of the inner entrance to Hudson's Straits were so named by Hudson on his last sad voyage in 1610; but he never landed on them, being baffled in his attempt to do so in search of "fowle" by a contrary wind. The islands were named in honour of Sir Dudley Digges, who subscribed largely towards the expense of this voyage. Hudson's mutinous crew on their return landed and gathered "cockle-grass." Sir Thomas Button, in 1612, remained a week on the islands, and fitted up there a pinnace which he had brought out from England. Bylot in his voyage in 1615, with Baffin as his pilot, killed seventy fowle here, "for in this place is the greatest quantity of fowle (which we call Willocks) that in few places else is it like to be seen, for if neede were we might have killed many thousands;" in fact somewhere on these islands, Hudson could not sight the exact place twice, was in his day a vast "Loomery." Everyone who passes through Hudson's Straits seems to see these islands, but I can find no other record of any one's landing there until a Meteorological Station, was established and Dr. R. Bell botanized there in 1884-85. A list of the Exogenous Plants found by Dr. Bell is published in the 'Catalogue of Canadian Plants,' Part III., by Professor Macoun, Botanist to the Geological and Natural History Survey of Canada.

Captain Markham landed on West Digges Island, lat. 62·31 N., long. 78 W., on the 21st of July of last year, and made a collection of plants which no doubt represents pretty well the plants flowering at that time on the island. These plants tell by their condition their own tale of cold and hardship. *Saxifraga hirculus*, which at Churchill was six inches high, with large flowers, is here reduced to its variety *alpina*, an inch and a half high, with quite small flowers. *Saxifraga trienspidata* is reduced in the same proportion. *Epilobium latifolium*, which at Churchill had splendid mauve flowers as large as a florin, here fails to flower at all. *Astragalus alpinus* is reduced to a mere groundling almost without stem. *Pyrola rotundifolia* is represented by its variety *pumila* with but one single flower in place of a dense spike. And most significant fact of all, whilst Churchill has six berry-bearing plants, so far as this collection goes, the island has not one single one*

* Dr. Bell finds three berry-bearing plants: *Rubus chamamorus*, *Vaccinium uliginosum*, and *Empetrum nigrum*.

which could contribute by its fruit to the support of mammal or bird. The Straits are usually blocked by ice for nine months out of the twelve; there is a cold polar current flowing southwards through Fox Channel, and the draught out of Hudson's Bay is cold also, for the ice in the Bay melts there every year and does not drift out; and past the eastern end of the Straits sweeps down the Great Polar current from Davis Straits. The result of all this is that the mean temperature of the year is under 15°, the mean of January is not above − 15°, and that of July is only about 45°.

The number of species collected by Captain Markham on this island is about forty, there being four or five flowerless and seedless scraps which are not sufficient for identification.

The following is a complete list:—

Ranunculus affinis, Br.
Ranunculus nivalis, L.
Papaver nudicaule, L.
Braya alpina, Sternb.
Draba androsacea, Wahl.
Draba alpina, L.
Eutrema edwardsii, Br.
(Crucifer, Scrap).
Cerastium articum, Lange.
Cerastium alpinum, L.
Honckeneya peploides, Ehr.
Stellaria longipes, Goldie.
Astragalus alpinus, L.
Oxytropis uralensis, pumila, Ledeb.
Dryas integrifolia, Cham. and Schlect.
Potentilla vahliana, Lam.
Epilobium latifolium, L.
Campanula uniflora, L.
Saxifraga hirculus, alpina, Eugl.
Saxifraga cernua, L.
Saxifraga oppositifolia, L.
Saxifraga tricuspidata, Retz.
Saxifraga cœspitosa, L.
Taraxacum officinale, D. C.

Matricaria inodora, L.
Pyrola rotundifolia, pumila, Hook.
Cassiope tetragona, L.
Mertensia maritima, Don.
Pedicularis langsdorffii, Fisch.
Pedicularis flammea, L.
Salix (arctica, probably).
Luzula spicata, D. C.
Luzula (arcuata, Sw., probably).
Eriophorum capitatum, Host.
Carex (fuliginosa, S. and H., probably).
Alopecurus alpinus, L.
Dupontia fischeri, Br.
Hierochloe alpina, L.

There are a few notes on these plants which may be worth recording.

Ranunculus nivalis. Some of the specimens approach *R. sulphureus*, (Sol.) particularly in their foliage, but are not sufficiently distinct to be separated. *R. nivalis* and *R. sulphureus* seem to be connected by intermediate forms.

Papaver nudicaule. These specimens do not at all approach *P. alpinum* either in the colour of the flowers or narrowness of the leaves; in this case again there is in the Herbarium at Kew, a series uniting the extreme forms by insensible gradations.

Draba alpina has at least two forms, one with flowers of a bright yellow, and the other a much smaller plant with cream-coloured flowers, both however are exactly similar to specimens at Kew.

Braya alpina is represented only by a single insignificant dwarf plant.

Cerastium arcticum, Lange (?). Very much resembles some Scotch specimens which I suppose should be so named. Whilst decidedly different from *C. alpinum*, this plant is certainly not *C. latifolium* (L.), as represented by European specimens.

Stellaria longipes, Goldie, from the Island is a dwarf compressed form, very different from the attenuated weak form from Churchill, but both are exactly like some of Goldie's own specimens. It is a very variable plant.

Saxifraga oppositifolia from the island has unusually large flowers.

Pedicularis flammea and Langsdorffii are exactly like specimens so named at Kew.

Luzula (arcuata) closely resembles an old Scotch specimen in my possession so named.

The greatest interest attaching to this collection arises from the fact, that so far as it goes, practically speaking, the flora of West Digges Island is almost identical with that of Floeberg Beach, where the "Alert" wintered in 1875-76, twenty degrees further north in lat. 82·27 ; the only intrusion of more southern forms being the two *Leguminosæ*, *Matricaria*, *Pyrola*, *Mertensia*, *Pedicularis*, and *Luzula*, whilst in the Genus *Eriophorum* (cotton grass), Digges Island, has distinctly the more northern form *capitatum* in place of *E. polystachion*.

In order to try to realise what a difference in the vegetation of more temperate climates 20° of lat. or about 1200 miles makes, let us take this room where we are to-night. Twenty degrees lat. south of us (about the same long.), will land us in North Africa at the back of the Atlas Mountains, on the borders of the Great Desert, in the home of the Date Palm. Or take the Færoe Islands in the same lat. as West Digges Island, and whose flora we are going to compare presently with that of the Island—20° south of them will land us just about the Gerez in Portugal, amid the flora of which Mr. Corder told us not long back—will take us from a country absolutely without trees, green with herbage all the year round, under copious mists, to a land of arborescent Heaths, Narcissi, and wild Olives, green enough in spring, but burnt brown and tawny early in summer; and yet between 82° and 62° of north lat., the long. being about the same, there is really very little difference in the flora.

To compare this collection with the Flora of Floeberg Beach by Genera.

West Digges Island has	Floeberg Beach has
2 Ranunculi	2 Ranunculi (identical)
Papaver	Papaver do.
2 Drabæ	3 Drabæ (1 identical)
Eutrema	Cochlearia

West Digges Island has	Floeberg Beach has
Braya	Braya (identical)
2 Cerastia	2 Cerastia (1 identical)
	Lychnis
Stellaria	Stellaria (identical)
Honckenya	Arenaria
Astragalus	
Oxytropis	
Dryas	Dryas (identical)
Potentilla	Potentilla
Epilobium	Epilobium (identical)
5 Saxifragæ	5 Saxifragæ (3 identical)
Taraxacum	Taraxacum
Matricaria	
Campanula	
Pyrola	
Cassiope	
Mertensia	
2 Pediculares	
	Polygonum
	Oxyria
Salix	Salix (probably identical)
2 Luzulæ	Juncus
Eriophorum	Eriophorum
Carex	2 Carices (1 probably identical)
Alopecurus	Alopecurus (identical)
Poa	Poa
Hierochloe	Festuca

There are two European floras of just about the same latitude which we may compare with advantage with that of West Digges Island: one that of the Færoe Islands, which lie between 61·20 and 62·25 N., and the other that of the Sogne Fiord in Norway, in lat. 61 N.: these three localities will all have about the same length of day, viz., twenty hours on the longest day in summer, and four hours on the shortest day in winter; but whilst the first lies in the icy grasp of the Arctic currents, the other two are favoured by the warmth of the Gulf Stream, and the result is that Digges Island, or at all events the coast near it, has sometimes so low

a temperature as — 53°, and often from — 38° to — 48° for several days together, and on the mainland in the same latitude the Great Slave Lake is frozen for six months out of the twelve; and the ice in winter is never less than five and often eight to nine feet thick; but at the Færoes the ice on the ponds is seldom so strong that a person can walk on it with safety. At Digges Island we find about sixty or seventy* flowering plants altogether, including Dr. Bell's list. At the Færoes we find over three hundred, and at the Sogne Fiord about six hundred and seventy. At Digges Island and at the Færoes there is not a single tree, but at Sogne Fiord there are forest trees in abundance, Elm, Oak, Alder, Birch, Fir, Pine, and Yew, and favoured by the extraordinary physical formation of the country in which deep narrow valleys extend from the sea level, within a short horizontal space to the snow line, peaks of 8400 feet high, being within nine miles of the sea shore; the summer heat in the valleys becomes often almost tropical, although a glacier in one of them descends to within 425 feet of the sea level. On the old moraines of glaciers in these valleys the Alpine flora descends to within about 100 feet of the sea level, but in the valleys themselves grow Vines, Peaches, Apricots, Walnuts, and wild woods of *Prunus avium*, and there is the largest orchard in Scandinavia; in fact the narrow valleys are natural hothouses, from the heat of the sun reverberated by the steep black rocks; the Alpine plants taking advantage of the shady northern sides of the deep rifts. Even so far north as Spitsbergen, which in latitude approaches that of Floeberg Reach, there are 111 flowering plants as compared with 32. Now if in our own time we find such differences of climate as these, with corresponding differences of flora, produced in the same latitude by the action of currents and the physical arrangement of the land—we surely need search no further for the conditions which have produced in more or less remote geological periods the flora which we know by its fossil remains to have existed in those regions nearest to the Pole from which we have any records—than altered relations of currents, and the position and elevation of land. There appears to be no necessity to invoke the extraordinary agency

* This estimate of "sixty or seventy" species is arrived at thus: Captain Markham finds forty species, including Endogens, Dr. Bell about twenty more Exogens, and no doubt there will be a few more Endogens than those included in Captain Markham's list.

of altered obliquity of the axis of the earth to account for what may have been quite well brought about by causes similar to those at present in action; acting, as no doubt all natural forces do act, with less force now than they did—for example, in the time of the deposition of the Miocene Strata—for in all the records I have searched I do not find any proof, so far as vegetation is concerned, of any very great heat in Northern latitudes. Even supposing the Coal of these high latitudes to be truly "Carboniferous," which it is *not*, the nearest resemblance to the flora of the Carboniferous era at present existing is to be found not in the tropics, but in lat. 43 to 45 S. in a damp, misty, sunless climate, and the nearest representative of the flora of the Miocene Epoch will probably be that of Japan, which grows in an insular climate of great regularity and few extremes, rather than of great heat—and of any flora of a much hotter climate than these (such as that of the Eocene beds of Great Britain) I find at present no trace.

It will naturally be expected that I should refer to the remarks made by Colonel Feilden in his Presidential address, with reference to the supposed origin of life on the globe in Polar Regions. The small herbaria before us are quite too small to afford any evidence either for or against any theory of distribution, much less of origin; they belong almost entirely to that great Scandinavian Flora which has been shown by Sir J. D. Hooker to be the farthest extended at the present day of any flora in existence, and whose distribution presents some difficulties which even he cannot solve; but so far as I am capable of appreciating the evidence on this hypothesis, I quite agree with Colonel Feilden's remark, "that the facts, so far as known, do not contradict it."

We have seen that, so far as temperature goes, there does not seem any insuperable difficulty to the existence of a Miocene, or even of a Carboniferous flora, at or near the Pole, under varied conditions of the earth's surface; there remains then to be considered the question of the amount of light required for luxuriant vegetation. We know that the maturity of plants is in most cases determined by the amount of heat received, directly or indirectly from the sun, and that a certain number of degrees of heat are required to bring each species to perfection, and that it is not a matter of vital importance over how many days those degrees of heat may be distributed; this is really what we mean when we

say, *e.g.*, that the harvest is usually a fortnight to three weeks earlier south of London than it is in Norfolk; the corn really receives the requisite number of degrees of heat required to ripen it so many days sooner in the one case than in the other. But if the necessary warmth be present, great luxuriance of vegetation may exist without very brilliant light. I do not find any definite reckoning of the quantity of light which exists under the shade of the primæval tropical forests such as Colonel Feilden has given of the Arctic twilight; but all travellers agree as to the "gloom" of the forests.

Bates, on the River Amazon, describes "the trunks of the tall forest trees rising at irregular intervals from the water, their crowns interlocking far above our heads, forming a thick shade . . . . . bunches of grass, *Tillandsia*, and ferns sitting in the forks of the lower branches . . . . . the stillness and gloom became almost painful . . . . . a cool, moist, clammy air pervaded the noiseless shade." Again, "we often read of the silence and gloom of the Brazilian forests; they are realities, and the impression deepens on a longer acquaintance," and yet he speaks of the ground beneath the trees as "carpeted with *Lycopodium*," and of the number of ferns. Darwin, at Rio Janeiro, says: "If the eye was turned from the world of foliage above to the ground beneath, it was attracted by the extreme elegance of the leaves of the ferns and *Mimosæ*, the latter in some parts covered the surface with a brushwood only a few inches high." Kingsley, again, in the "High Woods:" "Round our feet are Arums with sunwhite spadixes and hoods, one instance among many of brilliant colour developing itself in deep shade. But is the darkness of the forest actually as great as it seems . . . . . At least we may be excused, for a Bat has made the same mistake and flits past us at noonday." Mac Gillivray, writing to his friend, E. Forbes, and describing the Australian Bush, says: "Eucalypti of enormous size and gigantic fig-trees form a canopy above, while below the dense underwood is bound together into a tangled and almost impenetrable mass by creepers and parasitic plants, mixed up with cabbage-palms and tree-ferns. A kind of churchyard dampness pervades the atmosphere of these gloomy solitudes."

It seems then certain, by the testimony of many witnesses, that luxuriant vegetation does not always require an enormous amount

of light; in short it does not appear that, given the necessary conditions of equable climate, there would be any insurmountable obstacle to luxuriant vegetation in the present proportions of day and night in lat. 82·27, as the blaze of light during the time when the sun remains above the horizon without setting, might neutralise the effect of the darkness of the winter, and the average amount of light received by the plant during the whole year might be as great as that received in constant shade. At first sight the greatest difficulty appears to present itself in the case of evergreens such as Magnolia; but evergreens are by no means absent from the Arctic flora even under present conditions. There are at least six evergreen plants which still grow in high latitudes in the Western Hemisphere:—

Pyrola rotundifolia	extends to	69·15 N.
Rhododendron lapponicum	„	72·20 „
Phyllodoce taxifolia	„	72·20 „
Loiseleuria procumbens	„	72·20 „
Empetrum nigrum	„	78·45 „
Cassiope tetragona	„	78·50 „

and this last in the Eastern Hemisphere, at Spitsbergen, very nearly touches the eightieth degree, being found at 79·20 N.

It seems safer to assume the adaptation of plants to their circumstances, than to require the alteration of circumstances at a great and unknown distance of time in order to account for the presence in high latitudes of the representatives of plants which are now living under what we consider a more favourable distribution of light throughout the year. The adaptability of plants to their circumstances is very great; for instance, *Silene acaulis*, which descends to the sea level in Shetland, was found by Meyer at 10,370 feet above the sea in the Bernese Oberland, and by Saussure at 11,392 feet on Mont Blanc, flourishing and flowering at a height of from 1,500 to 2,500 feet above the level of perpetual snow.

Supposing the three floras of equal latitude to which we have alluded, that of Digges Island, the Færoes, and the Sogne Fiord, to be preserved in a fossil state and examined by geologists of a future time, when by some alteration of the level of the land the present set of the oceanic currents was altered and a warm

current flowed up Davis Straits, and a compensating cold current poured down past Spitsbergen and the Faeroes, impinging on the coast of Norway, and reducing its climate to the cold now found on the coast of Labrador, would not their remains present to the men of that time almost as puzzling a problem for solution as the fossil remains of the Miocene Epoch do to ourselves.

It is impossible to show to-night the whole of the plants collected. I choose for exhibition the three which are known to grow furthest north, in fact on the most northern land yet reached by any Arctic explorers, they are :—

Saxifraga oppositifolia, traced to lat. 83·8 N.
Papaver nudicaule, Alopecurus alpinus, } traced to lat. 83·4 N.

Among the plants from West Digges Island I found adhering to the drying papers two Red Mites, these I sent to Mr. A. D. Michael, who most kindly examined them, and considers them to belong to the Genus *Caligonus* (or *Raphignathus*, according to whose nomenclature you adopt), "but he does not think it possible to identify the species. In the year 1871, however, Thorell described a species which he called *Rhagidia gelida*, from two specimens found by Holmgren at Beeren Island. I strongly suspect this to have been your species, which seems likely."

There are a few Mosses and Lichens among these plants which Mr. E. M. Holmes has named for me; they are—from Churchill, a *Bryum* and *Claydonia rangiferina*, and from West Digges Island, a *Bryum*, *Racomitrum lanuginosum* and *Tortula ruralis*, also *Cetraria nivalis* or *cucullata*.

I have to thank my kind friend, Mr. Arthur Bennett of Croydon, for going through these collections and giving me the benefit of his notes upon them; Messrs. Britten and Ridley, of the British Museum, for naming many of the plants; and above all Mr. J. G. Baker, who allowed me to compare all the specimens which remained doubtful with those in the Herbarium at Kew. I have also to thank Professor Macoun for his great kindness in sending me his list of Canadian Plants in parts as published.

XI.

HYBRID FINCHES.

By Rev. H. A. Macpherson, M.A.

Read 22nd February, 1887.

The frequency with which certain species of Ducks and Game Birds interbreed, producing hybrid off-spring which are sometimes fertile in turn, is well known to Ornithologists.

The extent to which our European Finches interbreed under artificial conditions, has been less generally acknowledged. The object of the present paper is to show, from the writer's experience, the progress which has been made of later years in this direction.

Goldfinch (*Carduelis elegans*).

(1). The comparative ease which accompanies the matching of the Goldfinch with the Canary (domesticated), has induced many working men to endeavour to obtain hybrids between the Goldfinch and Bullfinch. The writer has personally known six men who succeeded in this essay. The male parent in all known cases has been the Goldfinch. In 1883, seven hybrids of this description were exhibited at the Crystal Palace Bird Show; in 1887, five appeared there in the hybrid class.*

The male birds differ from one another only in brilliancy or obscurity of tint, and the following description would apply to all

* The writer first met with hybrids between the Goldfinch and Bullfinch in 1870, but Mr. Harting has pointed out that two hybrids of this kind were exhibited at the Crystal Palace Show as long ago as 1858 ('Zoologist,' 1886, p. 109).

that the writer has examined when in full plumage. Bill conical, stouter than in the Goldfinch; forehead, chin, and malar region, golden red; crown black; back nut-brown; upper tail coverts white; wings black, the tips of the greater wing coverts forming a light red bar; tail feathers black, the outer rectrices edged with white on the inside; throat, breast, and lower parts, pink (often edged with cinnamon). The only two females that the writer has seen resembled males in all but their subdued tints, the pink breast of the male being replaced by dusky brown.

(2) The Goldfinch also interbreeds with the Greenfinch, and produces strong-voiced offspring, which do not acquire full beauty until their *second* annual moult. The following description applies to adult males of the Goldfinch and Greenfinch. Forehead and chin golden bronze or orange; crown and nape grey; back nut-brown; primaries black, edged with yellow or bright orange, tipped with white; tail black; breast and lower parts yellowish brown. In a young specimen the breast was dull brown, and the flanks were streaked as in a young Greenfinch.

(3) The Goldfinch pairs with the Linnet, and a female Linnet in Mr. Verrall's aviary mated with two Goldfinches in two seasons. In an adult Goldfinch-Linnet hybrid, shown at the Crystal Palace in 1887, the forehead is golden yellow (as in many Goldfinch-Canary mules); crown greyish black; back brown; quill feathers black, the primaries edged with gold; throat and lower parts light brown.

In the nestlings bred by Mr. Verrall in 1885, the head and upper parts were of a Linnet-brown, the primaries narrowly edged with yellow; lower parts brown. The shape is usually that of the Linnet.

(4) The Goldfinch occasionally pairs with the female Siskin. A hybrid of this description shown at the Alexandra Palace Show approximated in size and greyness of colour to a female Siskin, but possessed the bright forehead of the Goldfinch.

(5) The Goldfinch rarely pairs with the Lesser Redpoll, but a hybrid Goldfinch-Redpoll was exhibited at Westminster in 1886. This bird resembled the Redpoll in the disposition of red upon the forehead; the upper parts were brown as in the Redpoll; quill feathers black, the inner primaries edged with yellow; throat

whitish; breast banded with cinnamon; abdomen white; flanks striated with dark brown, as in the Lesser Redpoll.

Bullfinch (*Pyrrhula europæa*).

(1). The female Bullfinch pairs with the male Linnet, and the following description applies to any male Bullfinch-Linnet hybrid. Forehead cinnamon; crown brown, with black striations; back brown, streaked with black; superciliary stripe and malar region greyish; upper tail coverts white; wings and tail black; throat cinnamon; breast pale red; abdomen white.

(2) The Bullfinch has united in at least two instances with the Lesser Redpoll, and the accompanying description was taken from a living bird in 1887. Crown and sides of head pale crimson; back dark brown, edged with lighter brown; upper tail coverts pink; quills black; throat and lower parts pale crimson.

(3) The Bullfinch has paired with the Greenfinch, Mr. Scott, of Carlisle, having bred hybrids from the cross; but none have as yet been examined by the writer.

Linnet (*Linota cannabina*).

(1). The Linnet often interbreeds with the Greenfinch, and the description of a cage-moulted bird would be: crown, occiput, and back brown: quills dark brown, edged with yellow; throat and breast brown: flanks brown; abdomen white. Some examples have a golden breast, and Mr. Salter possessed a wild caught bird in which the breast was pink.

(2) The Linnet has interpaired with the Lesser Redpoll in several instances. A hybrid Redpoll-Linnet, exhibited in 1887, resembled in size and general colouration a Lesser Redpoll. The forehead was yellow; the darker streaks on the sides of the head corresponded exactly with those of the Linnet.

Redpoll (*Linota rufescens*).

The Lesser Redpoll and Siskin have together produced hybrid offspring, but the writer has not seen specimens of the cross.

Greenfinch (*Ligurinus chloris*).

(1). The Greenfinch has interbred with the Siskin. In 1883, a hybrid was produced by the union of the foregoing, but was deserted and died ('Zool.' 1883, p. 339).

(2) The Greenfinch has interbred with the Twite in Mr. Verrall's aviary, but the writer failed to examine the offspring.

The foregoing data prove that the Goldfinch produces hybrids by union with five other Finches, viz., the Greenfinch, Linnet, Siskin, Redpoll, and Bullfinch; that the Greenfinch interbreeds with five species, viz., Goldfinch, Siskin, Linnet, Twite, and Bullfinch; that the Bullfinch crosses with four species, the Goldfinch, Linnet, Redpoll, and Greenfinch; that the Siskin has crossed with the Goldfinch, Greenfinch, and Lesser Redpoll; that the Lesser Redpoll unites with the Bullfinch, Goldfinch, Linnet, and Siskin.

The writer is further informed that the Greenfinch has interbred with the House Sparrow, and the Brambling with the Chaffinch. He has seen the Tree Sparrow pair with the House Sparrow, though the experiment was incidental, and no results followed. Bechstein appears to vouch for hybrids having been produced between the House and Tree Sparrow.*

Of all the foregoing species, only three are known to the writer to produce hybrid young in a wild state, *i.e.*, the Goldfinch, Linnet, and Greenfinch, each of which interbreeds occasionally with the other two.

The above-mentioned Finches, with the addition of the Serinfinch, produce hybrid young (frequently entirely yellow) with domesticated Canaries. Of such hybrids, the most frequent is that between the Goldfinch and Canary. Such birds usually possess the dark striations which characterise the flanks of the wild Canary. Many Goldfinch and Canary mules are white-throated, or "cheverels," even though bred from ordinary male Goldfinches.

The only Canary mule that appears to merit a description here, from its great rarity, is that obtained by a union with the Bullfinch.

Such a hybrid was exhibited alive in the Westminster Aquarium Bird Show of November, 1886. Its shape resembled that of a "Glasgow don" Canary, as did the tail which drooped slightly beneath the perch; the plumage was soft and fluffy; bill white, tinged with black, resembling rather that of the Canary than Bullfinch; forehead tile-red; crown black, each feather streaked

* Mr. Otty, of Norwich, has paired the House and Tree Sparrow, and bred from them more than once, but only one of the hybrid offspring has lived to maturity.—J. H. Gurney, Jun.

with brown; back brown, each feather with a dark streak, and with greyish edges; wings black, the tips of greater wing coverts reddish, forming a light bar; tail feathers black; throat, sides of head, breast, and rump, all tile-red; under tail coverts white; legs flesh coloured; claws black. On enquiry, the writer learnt from Mr. Fowler, of Halifax, that this bird was produced by the union of a male Canary (of the "Glasgow don" variety) with a female Bullfinch.*

XII.

ON SOME NEW AND RARE PLANTS FROM WELLS AND ITS NEIGHBOURHOOD.

By Frederick Long, L.R.C.P.

Read 22nd February, 1887.

The following Plants which I have come across during the last two or three years are interesting as being some of them new to the county, whilst one is an addition to the British Flora. My best thanks are due to Mr. Geldart for his kindness in examining the specimens and getting them identified by Mr. Arthur Bennett.

Trifolium pratense, var. parviflorum, Bab. A single plant growing amongst the ordinary form on a chalk-marl slope at Stiffkey. Mr. Bennett in reporting upon it says: "It occurs in Denmark, as Lange refers it to Babington." Syme in E. B. says: "I have only seen this from Forfar." I have not succeeded at present in finding any other specimens. An addition to the County List.

* This Canary-Bullfinch died in the following January. Similar birds have been obtained, but very rarely, in Germany.

Sonchus arvensis, var. angustifolia, Meyer, var. arenaria, Hallier. This plant is an addition to the British Flora. It grows pretty plentifully on a sandy waste at Wells, but does not seem to have been noticed before. I first found it in 1882, but was quite unaware of its true connection, and last year I sent some fresh plants to Mr. Geldart, who forwarded them on to Mr. Bennett. It is of West European origin, and grows in the East Frisian Islands off the coast of Denmark.

Statice limonium, var. pyramidalis, Syme. Although I have known this plant for many years, I believe it was first published a short while ago from Cley by Mr. Hanbury. It is plentiful on the marshes at Wells, and is at once distinguished by the larger scapes, more slender branches, and fewer flowers.

Sclerochloa Borreri. Growing amongst rushes and other herbage on wet sand at Holkham. With the exception of north-east Yorkshire, Yarmouth is the most northern limit of this species previously recorded.

Festuca duriuscula, var. filiformis, Parnell. In a wood in Holkham Park. A very beautiful variety, growing in dense tussocks and delighting in a shady glade.

Bromus erectus, var. villosus, Syme. On dry chalky soil by the side of the road between Peterstone and Holkham. An addition to the County List.

In addition to the above, I have found the following somewhat rare plants growing in the district.

Papaver hybridum. The old brick yard at Wells and neighbouring fields, mixed with *P. argemone*.

Diplotaxis muralis. Plentiful on dry chalky soil about the town and in a railway cutting.

Cochlearia Danica. Both forms of this plant occur on the marshes.

Lepidium latifolium. As a weed in two or three gardens at Wells.

Lepidium draba. This plant suddenly appeared amongst the ruins of the old malt-house at Brancaster about five years ago, when the building was pulled down. It has spread about over the rough ground, and at the present time there is a good large patch of it.

Hypericum androsæmum. On a wet clay bank for about half-a-mile between Binham and Hindringham.

Hypericum calycinum (!) Plentiful in Holkham Park and now generally in gardens and shrubberies.

Ononis repens, L. Sides of roads; frequent.

Ononis spinosa, L. Plentiful in a wet meadow at Field Dalling.

Medicago maculata. Generally distributed about on road sides and borders of dry fields.

Medicago denticulata. Plentiful on railway embankment, Wells, and in dry chalky places; also at Burnham Deepdale.

Trifolium striatum. In a dry gravelly railway cutting, Holkham.

Inula conyza. Generally distributed about.

Specularia hybrida. Railway cutting, Wells, and other dry waste places; not very frequent.

Veronica buxbaumii. Plentiful everywhere.

Origanum vulgare. In large patches at Wighton and Cockthorpe.

Marrubium vulgare. As a weed in gardens.

Lithospermum officinale. Frequent in hedgerows and copses.

Daphne laureola. Frequent in hedgerows.

Blysmus compressus. Swampy meadow, Burnham Norton.

Phleum pratense, var. nodosum. This is the usual form of the plant in the district, and is common on every hedge-bank. *P. pratense* proper I have only found in two or three moist situations.

Sclerochloa maritima. Plentiful on the salt marshes.

S. distans. Along the quay at Wells and marsh banks.

S. rigida. Plentiful on walls and dry places.

XIII.

NOTES ON THE HERRING FISHERY OF 1886.

By Thomas Southwell, F.Z.S.

Read 22nd February, 1887.

Early in the month of February last, a Conference of Fish Salesmen, Curers, Boat-Owners, and M.P.'s, met to discuss various matters connected with the Sea Fisheries of the United Kingdom, including: Railway Rates; Market Tolls; Import Duty on Foreign Herring; The Amendment of the Fisheries Convention of 1883; Whether anything could be done by the Legislature to improve the condition of the Herring Fisheries of the United Kingdom; The Preservation of Fish in Boracic Acid; Trawling by Steam, or otherwise, within the Three-mile Limit; The Constitution of the New Fisheries Department of the Board of Trade; The Importation of American Oysters; and lastly, A System of National Insurance for Fishermen. A sufficiently wide programme certainly, and one of great interest.

It will be sufficient to say of one subject, that the present "Department" does not give universal satisfaction, and that by some it was thought that a properly constituted "Board" (even though it had not the advantage of being immediately under a Minister of State), aided by the advice of practical men, would be more efficient than a "Department" virtually "under an Assistant Secretary, responsible to the General Secretary, responsible to the President," and advised by an Inspector, thus leaving "the whole fishing industry practically in the hands of an Inspector."

One of the speakers estimated the number of persons employed, directly and indirectly, in this industry at not less than 1,000,000,

and the capital invested at not less than £10,000,000; a by no means contemptible item in the national trade.

The only other subject discussed which directly concerns the present notes is that of the Herring Fishery; but conspicuous by their absence were some subjects of great importance, such as the Utilisation of waste fish products, A more profitable mode of disposal of the fish during the gluts which too frequently take place in the market than by throwing them overboard, or casting them in a crude state on to the land, Experimental enquiries as to better processes of preserving fish for, and methods of conveying them to the various distant markets; not to mention the vital questions of Exhaustion, or of Re-stocking already exhausted Fishing Grounds. These are all subjects which do not affect the present, however important they may be in the immediate future, and it is not to be expected that the busy practical men there present, whose sole object is to get the greatest quantity of fish out of the sea with the least possible expenditure of time and money, and to convey them to the best market as cheaply and expeditiously as possible, would have leisure to devote their time to such subjects, even if they had the necessary scientific training; but I venture to predict that the time is not far distant when such subjects *will* become of the greatest importance, and then the authorities will regret the absence of a scientific element in the Fishery Department or Board, whichever it may be, and it is only to be hoped the awakening may not be too long deferred.

In the mean time the Scottish Fishery Board is doing most excellent work (although it is by no means appreciated), and is accumulating facts and observations that may at some future day be of the greatest service. I wish to call attention to some of these observations on the vexed question of the size of the meshes of Herring nets now in use, trusting the result may be useful to some of our own fishermen.

Mr. J. Duncan Matthews, F.R.S.E., in a paper on "Variety among the Herrings of the Scottish Coasts," printed as an appendix to the 'Fourth Annual Report of the Fishery Board for Scotland,' contributes some remarks with regard to the relation between the size of the meshes, and the fish which are taken by them, which our fishermen will do well to bear in mind, although it seems impossible that they should not be fully aware of the

facts. Mr. Matthews states that undoubtedly the samples of fish submitted to him represent the size of the fish actually *caught;* but he finds it necessary to consider how far they represent the actual size and condition of the fish frequenting the Scottish coast, for, says he, "it has to be noted that the size of the fish sent to me for investigation or, to speak more generally, of all the fish brought ashore, is rather an evidence of the size of the mesh of the nets employed for their capture than a criterion of the actual size of the Herring in the sea; and according to the size of mesh we shall be liable to misjudge the actual size of the fish. I feel sure that the want of sufficient consideration of this fact, and especially of the circumstance that change of size of mesh has occurred, for any period or at any place, has given rise to erroneous ideas as to the preservation or decline of the general or natural size of the Herring; for, of course, it must be remembered that a particular size of mesh only takes those fish which fit it, that is to say, does not merely allow the smaller fish to escape by passing through its meshes while sweeping in all the larger, as in Salmon net or Seine trawl, but the large fish also, to a great extent, escape by not getting their heads into the mesh."

He also mentions that some of the largest fish he received, averaging twelve inches long, were "scummed fish," that is, fish which having been insufficiently meshed drop out of the net, but are "scummed" up from the surface by a boy appointed for that purpose; and expresses an opinion that it is almost certain the largest fish seldom become properly meshed. As a practical proof of the accuracy of these observations, Mr. Matthews gives the measurements of two samples of Herrings taken at the same time and place, one by a net, the meshes of which were considerably shrunk from being re-barked seven or eight times, and the other by a net which had been little used, and was therefore considerably wider in the mesh. In the former instance the fish averaged 258·6 m.m. ($10\frac{1}{4}$ in.), and in the latter 284 m.m. ($11\frac{3}{16}$), clearly showing the relation between the size of the mesh and that of the fish taken by each net. The experience on the Scottish coast is that although sexually mature fish may differ greatly in size, which difference may possibly be racial, still "of the fish caught in the early part of the season, a much larger proportion are immature and small, and probably also younger than is the case later on.

The adult fish appear to reach a more advanced stage of ripeness before they approach the spawning banks;" a fact which is fully borne out in our own autumn fishery which, it is admitted by many, is commenced too early, and in confirmation of Mr. Matthews' observations on the injurious effects of too small a mesh, one of our most experienced Yarmouth boat-owners assured me that such a net, although it fails to *mesh* the best fish, nevertheless kills a large number of the finest herring by imperfect meshing, and that they fall away and are lost.

Again, in the Report before quoted (p. 44), Professor Ewart calls attention to the vast increase of later years in the number of small fish (so called "matties") brought ashore, stating that in 1860 over 192,000 barrels of Scotch full, crown brand, Herrings were landed, and only 171 barrels were branded as "matties;" in 1875 the proportions were 281,000 full and 156,000 barrels of matties; and in 1885 there were only 200,000 barrels of full, crown brand, but 300,000 barrels of matties. He adds, "it is generally admitted that the great depression of the fishery industry which now prevails would, to a great extent, have been prevented, if half the small Herring [the matties] had been left in the sea." And in a paper published in the Proceedings of the Royal Physical Society of Edinburgh, the same authority again insists on the present paralysis of the fishery industry being, to a great extent, due to the large quantities of small immature fish with which the markets have been flooded, and states that "this is undoubtedly largely due to the fishermen using small-meshed nets, which, while they fail to "mesh" the large fish, capture large numbers of small, often immature fish that are scarcely fit for food. There is every reason to believe that the present unsatisfactory state of the Herring fishery might soon disappear, were the fishermen and curers to arrange to use nets with a mesh measuring, at least, an inch from knot to knot."

That this is by no means an exaggerated view of the case we have the evidence of a "practical" man, Mr. A. Maconochie, who, at the late Conference, is reported to have said that the decreased size in the mesh has cost "the unfortunate Scotch curers half a million of money!" Speaker after speaker admitted that the small size of the mesh, at present used, was highly detrimental to the fishery, and yet deprecated any interference with the present

custom, pleading that the size of the mesh should be left to the "good sense of the catchers!" and ending by the following stultifying resolution, which was passed unanimously: "That in the opinion of this Conference, the size of mesh of the Herring net, as now in use by many of our fishermen round the coast of the United Kingdom, is detrimental to the interests of both the fishermen themselves and the general public, and this Conference is further of opinion that the size of the mesh should be increased, having regard to the fact that small Herring are at this time practically unmarketable."

Mr. Gowing, of Yarmouth, writes, too, as follows: "It is, I believe, the unanimous opinion of all in the trade here that a small mesh is most injurious to the interests of the catcher, small (that is to say very small) Herring are virtually unsaleable especially in our home markets. I firmly believe that if every fisherman could be induced to use a larger mesh, say thirty rows 18-ply, thirty-one rows 15-ply, for Herrings, that it would considerably benefit the trade. It is not quantity we want, but size."

According to Mr. Bradbeer, the nets used at Lowestoft vary according to season from thirty-two to thirty-three rows 18-ply. Those used for the spring fishery having a smaller mesh. The nets in use from Yarmouth vary from twenty-nine to thirty-two meshes to the yard, as delivered from the factory, but the size of the mesh may be materially reduced in the subsequent process of "curing."

It is lamentable to think of the waste of food and the serious loss to fishermen which occurs should the market become glutted, and yet there are many better uses to which sprats and fish offal can be put than casting them on the land for manure. One of the greatest aids to commerce which a Scientific Fishery Board could render would be in experimenting and reporting upon the various processes of fish preserving for the benefit of the fishermen. Another direction in which incalculable service could be rendered is pointed out by Dr. Stirling in an article on "Some economic products from Fish and corresponding Vegetable products," printed in the Scottish Fishery Report for 1885. Other European countries are far ahead of us in such matters, simply because they recognise the service that science may render to commerce, for to the

fishermen and boat-owners all these things are a sealed book. Dr. Stirling concludes his article as follows, and I trust that we may some day recognise the truth of his remarks and benefit by them. "We want," says Dr. Stirling, "more and more to see the application of scientific methods to the development and improvement of our great commercial enterprises. It is astonishing how for centuries the same methods have obtained in the fishing industry; but let us hope that we have entered upon a new and prosperous phase of the great problem. We must look more and more to scientific progress to point the way in which, and to afford the means by which, improvements are to be effected."

It is sincerely to be regretted that, owing to the want of foresight on behalf of the authorities, it is only in the northern division of the kingdom that Dr. Stirling's hope is at all likely to be realised. It was admitted at the Conference that, owing to the high rates of railway carriage, Haddocks were not worth catching, and that "thousands of tons" of these fish, and Whitings, were thrown into the sea every year. Mr. Macomochie also said that "on the night of the 15th July, 1884, he saw one thousand tons of Herrings thrown into the sea, because the catchers refused to pay the extortionate rates charged by the railway company." Yet the only remedy which these "practical men" could suggest to obviate this fearful waste was the lowering of the rates of carriage by the railway companies. Not a word is said with regard to utilising in any way the thousands of tons of fish which are annually destroyed, or carted upon the land as manure. One feels inclined to ask what became of the fish fifty years ago, or have the railways really created the industry which they are said to oppress so terribly, and if so, how is it that it has developed so immensely under their Upas-like shade?

It will be seen by the table of returns, that the Herring Fishery is practically proceeding during every month in the year; even in January a few fish were landed at Yarmouth, but the bulk of the Herring then in the English market were of Swedish origin, and preserved with Boracic acid. These fish were very fine, four are said to have weighed 2 lbs. 5 ozs., and I saw many measuring 12½ in. to the fork of the tail; but, in consequence of the mode of preserving, they are said to be utterly flavourless. They were such fish as our small-meshed nets would not capture, and I am

assured that it is only their size that enables them to hold their place for a moment in the market. In February about 40 lasts were landed chiefly at Lowestoft; but as they were caught some fifty miles from port, and did not arrive in very fine condition, the price was not very remunerative.

In March the Spring Fishery was in full swing, and large numbers of Herring were occasionally brought in by the Lowestoft boats (on the 15th 80 lasts were landed). The quality generally very poor, but on one occasion as much as 5s. 7d. per hundred (£27 18s. 4d. per last) was realised for fresh fish, the price depending entirely on the demand for bait. During April 940 lasts were landed at Lowestoft, the supply varying greatly, and the prices fluctuating in a corresponding degree. Early in May both prices and quality were very low; on the 12th of that month I saw large quantities of Herring hawked about the streets of Norwich at eight for a penny, and dear at the price; but towards the end of the month, both quality and price improved very much. The spring voyage shows a return of 2337 lasts for Lowestoft, and 480 lasts for Yarmouth.

The summer voyage was very satisfactory to the Lowestoft people, and good prices, as a rule, were realized. The bulk of the Herring taken by the Yarmouth boats in the North Sea voyage in the month of August are brought home salted, the consequence being that the Yarmouth market is flooded with salt fish in that month when it is almost impossible to cure them owing to the heat and the oily nature of the fish; whereas the Lowestoft boats work more for the fresh fish market, and land their catches principally at Scarboro, Shields, or Grimsby, during the months of August and September; but as there is practically no market for salted Herrings at Lowestoft, many of the boats belonging to that port dispose of their cargoes at Yarmouth. The quantity landed at Yarmouth was 1654 lasts, and at Lowestoft 482 lasts.

During the Autumn Fishery, the usual fluctuations in supply occurred, accompanied by the usual extreme variations in price, from £2 10s. or less to £22 per last, and on one day from 5s. per hundred (fresh fish are sold by the hundred) early in the morning, to 10d. for the same quantity later in the day, when the market became over-stocked by fresh arrivals; stormy

weather occasionally helped the home boats a little by keeping the Scotch boats in port, but on their resuming fishing, the glut only became the greater.

Taking the season as a whole, the quality of the fish was far below the average, and the only period when really good Herring were brought in, was for about a fortnight in November, added to which the shoals lay a long distance off, very few fish being captured inside Smith's Knowle.

Mr. A. L. Gowing, of Yarmouth, in answer to my enquiries, writes me as follows with regard to some of the causes of the low prices realised during the autumn voyage: "We had some heavy gluts, on which days prices ran down dreadfully; good fresh Herring, although not very large, selling as low as £1 10s. per last. The great nuisance we suffered from all the season was the terribly large quantities of over-day, and even third-day Herrings that were landed; these were, of course, a drug in the market, and only made wretched prices—some days as little as 15s. per last. The Herrings lying a long way off, contrary winds, and very low price of Salt Herrings, accounts for so many over-day fresh fish being landed, the fishermen not caring to spend the money on the salt to cure them."

The number of Scotch and north country boats is becoming a serious matter to the home fishermen; at Yarmouth they number about 320 against 300 home boats, and at Lowestoft some 130 against 280 belonging to that port; the Scotch are also introducing steam propellers into the drift fishing, and five very fine boats from Greenock and Banff sailed from Yarmouth; but I am informed that they have not paid, and it is not probable that steam will ever be extensively used for that purpose.

It will be seen that the total catch of Herring during the year 1886 for the ports of Yarmouth and Lowestoft was 33,329 lasts, the largest quantity, with the exception of the year 1884, which I have yet had to record, the month of November alone producing 14,857 lasts. It is impossible to say with any degree of accuracy the average price, but it would probably not exceed £6 per last; and I am assured that on the whole the season of 1886 is one of the "blackest on record."

A remarkable feature of the past season was the presence of Mackerel during the whole of the Autumn Fishery, some of the

boats kept up this fishery from September to December, and always got fish, particularly in the month of November, when large quantities of splendid Mackerel were caught, and I am informed that all the boats did well.

Another feature was the great abundance of "Bottle-nosed Sharks," by which name the Porbeagle (*Lamna cornubica*) is known by the fishermen, which were brought in. I was rather puzzled what they might be at first, but Col. Feilden saw one, and subsequently I had the opportunity of examining three others at different times, so there is no doubt as to the species so known by the Yarmouth and Lowestoft fishermen.

As on former occasions, I have to thank Mr. H. Teasdel, Accountant to the Yarmouth Corporation, and Capt. Massingham, Harbour Master of Lowestoft, for their kindness in furnishing me with the quantities of Herring landed at their respective ports. I am also greatly indebted to Mr. A. L. Gowing, of Yarmouth, for much general information as to the Autumn Fishery at that place.

RETURN OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1886.

		Yarmouth.			Lowestoft.		
		Lasts (13,200).	Thousands (1320).	Hundreds (132).	Lasts (13,200).	Thousands (1320).	Hundreds (132).
Spring	January	9	2	8	—	—	—
	February	12	2	0	28	4	7
	March	232	1	7	816	1	9
	April	190	4	8	940	5	4
	May	36	7	0	551	8	7
Summer	June	31	2	4	65	4	9
	July	105	1	8	182	0	9
	August	1518	5	2	235	0	4
Autumn	September	2178	3	5	137	7	8
	October	7320	1	4	2827	7	0
	November	9270	8	7	5587	3	5
	December	739	5	9	312	2	4
		21644	7	2	11684	7	6
		11684	7	6			
		33,329	4	8			

XIV.

METEOROLOGICAL NOTES, 1886.

By Arthur W. Preston, F. R. Met. Soc.

Read 22nd February, 1887.

January.

Although the mean temperature was nearly the same as that of the previous January, viz., 35.3 degrees (or about 2 degrees below the average), the general character of the weather was of a much more winterly description. After a few mild and stormy days at the commencement, a cold period set in on the 5th and continued to the month's end. On the 6th London was visited by a severe snowstorm, which, however, did not reach Norwich till the following evening and early morning of the 8th, when the ground became covered to the depth of three inches. Further falls occurred during the next few days, but a temporary thaw and rain followed on the 13th. Severe frost again set in on the 18th with further falls of snow on the 20th and four following days. A cold and unsettled period ensued, and the month closed with more snow and frost. The prevailing winds were south-west and west, most of the snow coming from the west and north-west. Rain fell on thirteen days, and snow on ten days. Gales occurred on the 3rd, 16th, and 31st. Frosts were recorded on twenty-three nights, the most severe being on the night of the 18th, when 21.8 degrees was registered. Atmospheric pressure was very unsteady, and the barometer only exceeded 30 in. on the 7th and 10th, the mean being but 29.62 in.

February.

The cold weather now became even more intense. The mean temperature was as low as 34 degrees, or 1.3 degrees colder than January, and was the lowest recorded for February since the memorable February of 1855 (during the Crimean war). The

persistency with which the cold continued was remarkable, not one mild day occurring during the entire month, the highest day temperature being but 45 degrees. Frosts occurred on twenty-three nights, and snow fell on eight days. There was but little bright weather, a dull monotony prevailing, which was most depressing. With the exception of a gale on the 1st, the winds were chiefly very light from the north, north-east, and east. The barometer was almost uniformly high and steady after the third day, the mean being higher than for any month in the year.

March.

The monotonous cold for which the winter of 1885–6 will ever remain remarkable continued, without intermission, to the 18th of this month. A biting gale from the east south-east prevailed on the 1st, followed by a severe snowstorm in the evening of that day, and snow also fell on the 2nd, 3rd, 6th, 7th, 13th, 15th, and 16th. The mean temperature of the first fortnight was 33.1 degrees, or nearly 1 degree colder than February, and on the first eight days the ground was covered with snow. Frosts occurred every night to the 18th, skating was freely indulged in up to that time. In many parts of the county ice formed early in January continued to the middle of March, and was in good condition for skaters the whole of that period. Skating in March is extremely rare, and the severe character of the season may be estimated, when it is recollected that on the 12th March, 1886, over two thousand persons were skating and sliding on the lake in Regent's Park. The last thirteen days of the month were more genial and spring-like, bringing up the mean temperature of the month to 40.3 degrees, which was over 5 degrees warmer than that of March, 1883, 4 degrees colder than that of March, 1884, and slightly warmer than March, 1885. The rainfall was light, gales occurred on the 1st, 2nd, 26th, and 31st, and the barometer ranged from 29.11 in. on the 2nd to 30.42 on the 11th.

April.

This was for the most part a cold, ungenial month. The first ten days were squally and rough, with showers at times. A cold period of east winds set in on the 11th, and continued, with but little intermission, to the end of the month; of this period it may

be mentioned that that portion of it from the 11th to the 22nd was very ungenial and gloomy, but from the 22nd to the 28th there was much sunshine. On the last-named day it became very warm in the morning, and the wind veered to the south. The thermometer stood at 68 degrees at 9.30 a.m., but at 11 a.m. the wind shifted to the north with a great fall of temperature; by 2 p.m. the thermometer registered 50 degrees, or a fall of 18 degrees in four and a half hours. There was but little frost during the month, but the cold winds, and great prevalence of gloom during the first three weeks kept back vegetation to such an extent that the spring was the latest for seven years past. The barometer was fairly steady on the whole, the mean being 29.84 in.

May.

On the first three mornings of this month keen frosts were registered of an intensity not frequent so late in the season. The minima were respectively 28.2, 29.8, and 30 degrees. On the 4th the cold east winds gave place to a brief period of delightful spring weather. The thermometer reached 70 degrees and upwards on the 5th, 6th, 7th, and 8th, a maximum of 74 degrees being attained on the 7th. This fine weather was not, however, destined to last long. On the 9th the wind shifted to the east again, and a cold rainy period set in and continued to the 20th. The excessive rains of the midlands (which exceeded any that had occurred there for many years) did not extend to Norfolk, where not more fell than was required to refresh the dry land after the long period of parching winds. From the 18th to the end the weather was warmer but unsettled, with many showery days. The mean temperature of the month was 52.7 degrees, and although higher than that of the previous May, was slightly under average.

June.

With the exception of the last week, this was an exceptionally cold and ungenial month. The mean temperature was 55.7 degrees, the lowest recorded for any June during the last fifteen years. The rainfall was slight (only half an inch), and it is remarkable that this was the third dry June in succession. The first ten days

were attended with keen easterly winds and bright weather, reminding one of March; the next fortnight was even colder, with north and north-west currents accompanied with much dampness and gloom, and with very low day temperatures. The maximum on the 18th was but 50.8 degrees, a point frequently exceeded in January, and from the 15th to the 20th the thermometer never exceeded 57 degrees. On the 24th the first taste of summer was experienced, and the weather continued fine, bright, and warm to the month's end.

July.

The spell of fine summer weather which set in on June 24th, continued, with increasing heat, till July 7th. The maximum temperature of 80 degrees was exceeded on the 3rd, 4th, and 6th, but was not again reached during the month. From the 7th to the 11th the northerly current again returned with cold cloudy weather and light rain. This was followed by a very unsettled condition of the atmosphere during the remainder of the month, with bright days occasionally intervening. On the 12th (the first day of the Royal Agricultural Society's Show at Crown Point) heavy incessant rain fell all day (0.73 in. being recorded), and on the 14th there was an unusual barometric depression for July (29.32 in.), accompanied by a gale from the west. Very heavy rains occurred on the evenings of the 23rd and 25th (0.91 and 0.74 in. respectively). The total rainfall for the month was 4.01 in., the heaviest fall recorded for July since 1880. Winds were chiefly westerly and south-westerly, barometric pressure very unsteady, and a great prevalence of cloud after the 7th.

August.

Showery and unsettled conditions prevailed until the 19th of this month, when a great change occurred, and very fine weather was experienced during the rest of the summer. The thermometer reached 70 degrees and upwards every day from the 20th to the end of the month, and on the 30th it reached 81.6 degrees, and on the 31st 83.2 degrees, which was the highest temperature recorded since July, 1885. During the last ten days there was but little cloud, winds were light from all quarters, the barometer

high and steady, and the air very dry. The total rainfall for the month was 2.19 in. but no rain fell after the nineteenth day. The mean temperature of the month was 61.5 degrees, which was slightly under average, but that of the first twenty days was only 59.2 degrees. The mean of the last ten days was as high as 65 degrees.

September.

September 1st was the hottest day of the whole summer, and was the warmest known in September for many years. The maximum shade temperature reached 83.8 degrees, and the mean for the day was 72.3 degrees. A distant thunderstorm during the following night cooled the air, and on the evening of the 4th a severe thunderstorm passed over Norwich, attended with incessant vivid lightning. After this the weather continued fine, warm, and dry, with but little exception, to the 20th, after which cooler and less settled conditions prevailed to the month's end. The month was, however, an exceedingly fine and pleasant one, with a mean temperature above the average, and formed a marked contrast to the gloomy and wet September of 1885. Winds were chiefly south-westerly to the 13th, then north-easterly to the 24th, afterwards south-westerly to the end of the month.

October.

So fine and warm a week has rarely been recorded in October as that with which this month opened. The mean temperature of the period was 59.1 degrees, or about 5 degrees above the average, and the thermometer upon the 4th rose as high as 74.6 degrees. This temperature is said to be the highest recorded in October since 1859. In London, 80 degrees was registered on this day. The remainder of the month was chiefly fine and warm, the mean temperature being 53.01 degrees (against 45.22 degrees last year). It will be remembered that in October, 1885, the thermometer only reached 60 degrees on one occasion. In 1886 it reached this point on fifteen days, and exceeded 70 degrees on three days. The rainfall was 2.30 in., against 6.77 in. in 1885. Winds were from all quarters, and a destructive gale from the south occurred on the 12th. The barometer was unsteady at times, a deep

depression passing over the county on the 15th and 16th. The reading on the evening of the 15th was 28.83 in., the mercury continued below 29 in. for nearly forty-eight hours. The centre of this depression passed over the south of England, where a terrific gale prevailed, but the storm was happily not so severely felt in Norfolk.

November.

This was a mild, and on the whole a pleasant month. The weather was somewhat rainy in the second week, but the latter half of the month was very dry and fine. There were many bright days which helped to prolong the beautiful autumn for which 1886 will ever remain noted. Winds were chiefly from the south-west and west, but there were no severe gales. Very high barometric readings were recorded during the last fortnight, the mercury rising to 30.70 on the 24th. At this period the weather was very fine and bright, although London was visited by fogs of an unusual density.

December.

This was a remarkable month. The fine mild weather which had prevailed with but little intermission since the middle of August, gave place, on the 1st, to a sudden outburst of severe cold. On the 2nd a heavy snowstorm occurred, and on the night of the 3rd and 4th the thermometer fell to 17.2 degrees, the lowest for six years past. In some parts of the city readings as low as 13 degrees were registered. Frost and snow prevailed to the 6th, when very stormy weather set in accompanied by the greatest barometric depression that has occurred for many years. On the 8th, at 9 a.m., the barometer stood at 28.63 in., at noon 28.50 in., at 3 p.m. 28.39 in., at 9 p.m. 28.11 in., and at 11.30 p.m. 28.08 in. It seems that the centre of the depression passed over the north of England, the lowest reading recorded being 27.41 in. In London the minimum was 28.30 in., and it is stated to have been the lowest registered there since January 13th, 1843. The depression was accompanied by a heavy and destructive gale, and it was some time before the barometer regained its normal height and the weather became settled. The mean reading

of the barometer for the week ending December 13th was 29.11 in. On the 17th sharp frost set in again, and continued with but little intermission to the year's end, although the most severe period was from the 18th to the 22nd. On the morning of the 20th the temperature fell to 19 degrees, and on the 22nd to 15.8 degrees, which was the sharpest frost of the winter. There were frequent showers of snow, and on the night of the 26th a very heavy snowstorm from the south-east prevailed, doing much damage. The mean temperature of the month was 34.91 degrees, which is the lowest recorded for December for seven years past.

Summary.

The general character of the weather of 1886, as may be seen from the foregoing notes, was of three distinct classes. The first was a cold and cheerless period from January 1st to August 19th, broken by no permanent change, except a warm week at the end of March, another at the beginning of May, and a fine fortnight from June 24th to July 7th. The second period, from August 19th to December 1st, was of an opposite character, the general tendency of the weather being to warmth and fineness. The third period, the month of December, was cold and winterly and very stormy. Taking the four seasons in their order, the winter of 1885–6 may be said to have been a cold and exceptionally protracted one, without, however, any extreme severity. The spring was cold and ungenial, and vegetation late. The first part of the summer was variable, but chiefly unsettled and sunless; but the latter part was fine and warm. The autumn was extremely fine, giving place to a winter of even greater severity than the preceding one. The mean temperature of the year was, like that of 1885, under average, but the rainfall was about 3 inches less than that year, and about 2 inches under the average of the last twenty-two years at Norwich. A perusal of the accompanying table will show at a glance the principal variations of the barometer, thermometer, and hygrometer, the estimated amount of cloud, the rainfall, and the general directions of the wind in each month of the year.

1886.

Month.	Barometer. Highest.	Date.	Lowest.	Date.	Mean.	Thermometer. Highest.	Date.	Lowest.	Date.	Mean.	Hygrometer. Relative Humidity, 9 a.m.	Cloud. Estimated proportion 0—10.	Rainfall. Thorpe Hamlet. Inches.	No. of days.	Heigham. Inches.	No. of days.	Wind. Direction. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	Mean estimated force
Jan. .	30.04	12	29.04	18	29.620	51.5°	2	21.8°	19	35.3°	90	5.7	2.64	23	2.67	21	3	5	1	4	1	8	7	2	3.2
Feb. .	30.67	8	29.12	1	30.046	45.0	13	20.6	10	34.0	90	7.0	0.39	13	0.23	11	4	7	7	0	4	1	3	2	2.6
March	30.42	11	29.11	2	29.890	63.5	22	23.5	7	40.3	87	6.9	1.39	16	1.35	16	3	3	6	5	2	10	2	0	4.0
April	30.17	13	29.15	8	29.840	68.5	28	31.0	10	46.6	74	6.1	1.41	13	1.47	12	2	8	5	1	2	5	3	4	3.7
May .	30.42	5	29.09	13	29.860	74.0	7	28.2	1	52.7	72	5.4	2.55	16	2.54	16	1	5	6	0	10	6	3	0	3.0
June .	30.22	30	29.66	12	29.910	75.0	29	37.4	4	55.7	72	5.7	0.50	8	0.52	9	5	6	6	0	1	3	3	6	3.3
July .	30.29	3 & 4	29.32	14	29.867	82.6	4	42.0	10	61.3	74	5.4	4.01	18	3.98	17	2	3	1	1	5	6	8	5	3.4
Aug. .	30.26	20	29.52	13	29.962	83.2	31	42.0	3	61.5	78	4.5	2.19	13	1.82	11	2	4	2	1	5	7	6	4	2.6
Sept. .	30.52	15	29.68	10	30.012	83.8	1	42.6	23	58.9	76	4.6	1.82	13	1.75	10	4	4	5	0	5	8	2	2	3.3
Oct. .	30.38	30	28.83	15	29.789	74.6	4	36.2	23	53.0	85	5.5	2.30	15	2.94	15	1	1	6	8	4	3	5	3	3.2
Nov. .	30.70	24	29.01	6	29.875	58.2	1	30.0	24	44.1	90	6.1	2.61	17	2.61	17	3	4	2	2	1	9	6	3	2.7
Dec.	30.54	31	28.11	8	29.623	52.2	6	15.8	22	34.9	92	4.7	3.42	20	3.84	20	1	2	1	0	2	8	8	9	3.5
Means					29.857					48.2	81.7	5.6													3.2
Extremes & Totals	30.70	Nov. 24th	28.11	Dec. 8th		83.8	Sept. 1st	15.8	Dec. 22nd				25.23	185	25.72	175	31	52	48	22	42	74	56	40	

XV.

MISCELLANEOUS NOTES AND OBSERVATIONS.

Mediterranean Black-headed Gull (*Larus melanocephalus*). On 26th December, 1886, a fine adult specimen of this species was shot on Breydon, Great Yarmouth; a male by dissection. I was fortunate enough to purchase this great rarity about one hour after its capture. At first I did not recognize what species I had; but consulted the 4th edition of Yarrell, and I found an excellent description given by Mr. Howard Saunders. I at once found out what a prize I had obtained. This rare bird was *shot* purely by accident, with a cartridge the shooter could not extract. He was simply wanting any bird that might come, for a discharge of this cartridge, and luckily it was *Larus melanocephalus* which came in the way, as I believe this is the first authentic specimen which has been obtained in Great Britain. I am also glad to be able to write that it was shot in my own county, Norfolk; *adding to my rich old county's avifauna* one of the greatest rarities in Great Britain. On the morning of its capture, as I was walking on Yarmouth beach, I saw, as I thought, a *Larus minutus*: it came close to me and showed its white wings, but I thought it was rather large for a Little Gull; in about two hours after this I had in my hands the *Larus melanocephalus*. I had the pleasure of inspecting it before the life-tints were altered. It was seen in flesh by Mr. J. H. Gurney, Junr., Mr. T. Southwell, and Col. Feilden. The breast-bone, etc., I am cleaning for preservation.—G. Smith.

Assumption of Male Plumage no invariable proof of Barrenness in a Gallinaceous Bird. At p. 184, it is stated that Gallinaceous Birds become barren when they assume male plumage, a statement which requires modification, for in the

"Field" newspaper three instances are given of domestic Fowls laying eggs (*Vide* the "Field," Nov. 1st, 1884, Aug. 21st, and Sept. 4th, 1886), these Fowls having assumed male plumage previously; in one case young birds were hatched, in the others the eggs were not fertile. To make my remarks correct, readers must insert the word "*usually*" in the 21st line. For such a female Fowl to produce chickens must, however, be extremely rare, for Dr. Tegetmeier tells me that in the whole of his long experience, he has never known a case; and it is apparently very uncommon for any Gallinaceous bird which has assumed the male plumage even to lay eggs,—much less produce young.

J. H. Gurney, Jun.

Occurrence of the Serin Finch at Yarmouth. A Serin Finch, *Serinus hortulanus*, of Linnæus, was netted by a bird-catcher on the North Denes at Yarmouth, on the 5th February, 1887, and was brought to me, by Mr. Cole, in the flesh on the 8th, having been kept alive at Yarmouth for two or three days. It proved to be a male bird on dissection. This diminutive Finch, whose habitat is Southern Europe and North Africa, has occurred several times in England, and, as may naturally be supposed, chiefly on the south coast, and as Professor Newton remarks in the fourth edition of Yarrell's 'British Birds,' the Serin has, of late years, been observed to be extending its range on the Continent, and might well be expected to occur in England. Mr. Newton records eleven specimens as having been met with in this country, the earliest identified, a male, caught near Portsmouth, in April, 1852. Of these eleven specimens, seven were taken near Brighton, one near Portsmouth, one at Worthing, one in Somersetshire, and one near London, recorded by Mr. Bond. The present example, though the first that has come under my notice in Norfolk, is not, I believe, the first identified as having occurred in this county, as Mr. J. H. Gurney, Junr., in the addenda to his list of Norfolk birds contributed to Mason's 'History of Norfolk,' states that Mr. G. Smith, of Yarmouth, informed him that a male Serin was shot in a garden on the outskirts of Yarmouth on June 13th, 1885, and is now in the collection of Mr. R. W. Chase, of Birmingham.

H. Stevenson.

Extracts Relating to Hawking.—From a Manuscript at Felbrigge Hall entitled "A booke of Disbursm^ts for Iohn Windham Esq for the yeares 1653 . 1654 . 1655 . and 1656."

	£	s.	d.
For a paire of Stuff bags for the ffalconer .	0	3	6
Two Ruster hoods for the Hawkes . . .	0	0	8
To John Bond for expences when he fetch the Sparhawke from Barningham . . .	0	0	6
To Thomas Catheringe when he went up to London last with the Hawke . . .	0	10	0
To M^r Aldham for a Hawke	6	0	0

The following entries may probably be connected with feeding the Hawks:—

	£	s.	d.
For 3^lbs & a halfe of Birdlyme at 8^d p lb . .	0	2	4
For 7 duz Sparrows	0	1	0

J. H. Gurney.

Extracts from "A Booke of Cookery and Housekeeping, 1707," written by Katherine Windham, which is still in manuscript at Felbrigge Hall. She married William Windham of Felbrigge Hall, in 1668; William Windham died 1689; she survived him until 1729. They are both buried in Felbrigge Church.

"*To Mew Ruffs & Reeves.*—Put y^m in a boarded Rome, feed y^m with wheat boyled as for furmety, when it is cold breake it into y^r troughs, give y^m either bear or water to drinke, keep y^e place very clean, & let y^m have wheat straw to creep under, make y^r meat once in 2 dayes or it will be sower, some times give y^m raw wheat, put stones in y^r troughs, y^t y^e may not dable in y^r water, let y^m have gravell by y^m to keep y^r rome clean. All sea fowle must have stones in y^r troughs y^t they may not get in to wash."

"*To Mew Knats & Patreges.*—Put y^m in a Chamber & feed y^m with drye Wheat, give y^m water to drinke, set a sheafe of wheat for y^m to run under, when y^e Knats are fat y^e will Halt."

"*To Keep young Pheasents.*—Let y^m have Chees curds & Hauts eggs, when y^e grow biger wheat & sometimes boyled oats. A day or 2 before you spend y^m give y^m boyled milke & bread."

J. H. Gurney.

Occurrence of Myrmica lobicornis (nyl), in Norfolk. Mr. H. J. Thouless took three neuters of this Ant on Mousehold in 1886; it is the rarest species of true *Myrmica* found in Britain. They were found singly, and attracted his attention by skulking instead of running away as Ants do when interfered with. I have hunted Mousehold in search of Ants for many years, but never met with this very scarce species, which is easily known by its peculiar antennæ which are geniculated at the base, and have a spine at the point of geniculation.—John B. Bridgman.

Instinct at Fault.—Last autumn Mr. McRae, of Bournemouth, sent me four Ichneumons which Master Dolamore had bred from one of our scarcer Wasps (*Eumenes coarctata*), two of them proved to be the males of a *Crypti*, which has been twice before bred from the same host, and once from a bee. The Wasp in this country is scarce, and the parasite much scarcer. Each of these two parasites emerged from a separate cell of the Wasp, and also from one of the same cells there issued two more Ichneumons much smaller than the others, both having an aculeus far too short to pierce the hard sandy case of the cocoon, and deposit its egg in the larva within; I think that the parent Wasp did not use sufficient discretion in collecting the small Caterpillars for the food of her young offspring, but took two which had been previously stung by an Ichneumon. I might say these solitary Wasps make round sandy cells into which they put several Caterpillars after stinging them; this does not appear to kill, but only to stupefy them. When sufficient are collected, the Wasp lays an egg on them, and closes the cell. When the egg hatches, the young Wasp grub sucks the juices from the Caterpillars which serve for its food, when all finished it turns to pupa, and finally emerges a perfect Wasp. The grub, in this case, must have had a hard time of it, in the first place the two smaller Ichneumons' larva consumed two of the Caterpillars, and thus deprived the grub of a good part of its sustenance, and after which an Ichneumon egg was deposited in or on it, which, when hatched, sucked the juices from its body and caused its death. There is another way to account for the presence of the two smaller Ichneumons, it is just possible that the parent Ichneumon, prowling about, might have entered the cell during the Wasp's absence, and

deposited its eggs in the larva it found there; but I do not think it likely, because the two Ichneumons were not the same species, nor even the same family, one belonging to the *Ichneumonidæ* and the other to the *Braconidæ*.—John B. Bridgman.

Norfolk Amber.—Mr. A. C. Savin has placed in my hands a piece of Norfolk Amber containing a Spider. The specimen was obtained, among others, from a fisherman at Mundesley, and there is every reason to believe that it really belongs to Norfolk. The Rev. O. P. Cambridge, who has examined it, writes that the Spider "is a ♀ of one of the *Theridiides*, but what genus I cannot say with certainty, as those parts on which the distinguishing characters chiefly depend are not discernible. It is, however, if not a *Nesticus*, very nearly allied indeed to it."—Clement Reid.

The Flora of Harleston (Addenda et Corrigenda, 1886). The circle of observation was extended to a six-mile radius at the commencement of the year; this, with a more careful examination of the previous district, resulted in an addition of forty species and five varieties of Flowering Plants to the list of the Club.

The *Carices* have been more thoroughly worked; but the most interesting discovery was *Aira canescens*, found by Mr. Walter Cordwell in a large pit of post-glacial gravel, known as "Homersfield Heath," on the south side of the Waveney Valley, about twenty miles from the coast. This rare grass, which is plentiful on the Yarmouth and Lowestoft Denes, has not hitherto been recorded so far inland. The specimens, though small, were abundant, and there are no reasons for supposing it is anything else but native; its presence here with *Teesdalia nudicaulis* in the same spot, and *Trifolium suffocatum*, *Rumex maritimus*, *Foeniculum vulgare*, *Samolus valerandi* in the immediate neighbourhood, affords distinct traces of the maritime flora which once prevailed in the Waveney Valley, and confirms the indigenous character of plants of the same species, which have long been known to exist on the present coast line.

The manuscript notes made by the late Rev. E. A. Holmes, F.L.S., on the Botany of the neighbourhood, have been placed in the writer's hands; they extend over a period of fifty years, and add many species—forty-eight in all—to the present list. Through

cultivation and drainage many of the plants noticed by him in the earlier years are now extinct.

To the observations of friends and the records of previous observers, duly examined, the Club is indebted for the localities of thirty-five species, making in all, with records of previous years, seven hundred and thirty-five species of flowering plants observed within the Harleston district.

Of the seven common plants stated in a previous paper as unknown, or extinct, two, *Saxifraga tridactylites* and *Athyrium Filix-foemina* (one plant only of each) have been found; *Pedicularis sylvatica*, *Asplenium adiantum-nigrum*, *Aspidium angulare* are reported on good authority.

Referring the observations of the year as before to the county divisions adopted by the Norfolk and Norwich Naturalists' Society, the following are worth mention.

*†Adonis autumnalis	c.	—
Ranunculus fluitans	c.	—
„ Drouetii	—	sc.
†Cardamine sylvatica	c.	—
*Hesperis matronalis	c.	—
Viola sylvatica (var. Reichenbachiana)	c.	—
Rubus scaber	c.	—
Callitriche hamulata	—	sc.
Helosciadium inundatum	—	sc.
Lactuca scariola	—	sc.
Chenopodium album (var. viride)	c.	—
„ „ (var. paganum)	—	sc.
Potamogeton rufescens	—	sc.
Luzula multiflora	—	sc.
Carex acuta (var. gracilescens)	—	sc.
Avena pubescens	c.	—

The variety *Reichenbachiana* of *Viola sylvatica*, first identified by the Rev. E. F. Linton, in Gawdy Hall Wood (August, full flower), and afterwards in other parts of the district, is a record new to the county, though *Riviniana* is common. *Rubus scaber* and *Carex acuta* var. *gracilescens* (named by Mr. Arthur Bennett) are also new to the Norfolk Flora.—F. W. Galpin.

* Introduced. † Holmes Manuscripts.

XVI.

FAUNA AND FLORA OF NORFOLK.

Part XI. Birds. Section II.

By J. H. Gurney, Jun., F.L.S., and Thomas Southwell, F.Z.S.
(Members of the British Ornithologists' Union).

Read 25th February, 1887.

147.* Land Rail (*Crex pratensis*).

A summer migrant somewhat uncertain as to numbers, but by no means abundant. Mr. Stevenson has recorded the autumns of 1854, 1857, and 1869, as periods of exceptional abundance of this species.

148. Spotted Crake (*Porzana maruetta*).

A spring and autumn migrant not unfrequently found as late as the months of October and November. A few pairs doubtless remain annually to breed in the Broads, but the nest is rarely found.

149. Little Crake (*Porzana parva*).

Since the first recorded occurrence of this species in Norfolk in May, 1812, some eleven other authentic specimens have been met with, the last being in October, 1880. One or two other instances of its supposed occurrence are not so satisfactory, as there is a possibility of Baillon's Crake having been mistaken for this species.

* In consequence of the accidental omission of the Nuthatch in the first section of this list, all the species subsequent to No. 70 are incorrectly numbered, with the present species the correct numbering is resumed.

150. Baillon's Crake (*Porzana bailloni*).

Also a spring and autumn migrant apparently of rare occurrence. Mr. Lubbock, however, remarks that "it appears far more rare than it really is, as it creeps and skulks about, and scarcely any Dog, however sagacious, can compel it to fly." Two nests believed to be of this species, and probably both constructed by the same pair of birds, were found at Potter Heigham on the 6th of June and 7th of July respectively in 1866, the first contained four eggs and the second five; the similarity however of the eggs of Baillon's Crake to those of the Little Crake renders their identification somewhat uncertain, as the birds do not appear to have been either seen or obtained.

151. Water Rail (*Rallus aquaticus*).

This species receives considerable additions to its numbers in spring and autumn (*cf.* 'Birds of Norfolk,' vol. ii. pp. 404, 407), and is also a common though somewhat local resident. The marshmen can generally show a nest or two at the proper season on our principal Broads, and Mr. E. Bidwell was informed by a dealer that he received over two hundred eggs in one season from Yarmouth (Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 134). Such traffic will soon result in the diminution of its numbers.

[7. Green-backed Porphyrio (*Porphyrio chloronotus*).

Has occurred five times, and as, after due enquiries, only one of the five can with any certainty be regarded as an escape, it seems reasonable to suppose the others were wild immigrants. Some further arguments in support of that view will be found in the 'Zoologist,' for 1886, p. 71.—G.]

152. Moor-Hen (*Gallinula chloropus*).

A very abundant species and generally distributed. A figure of a tawny-coloured variety with hair-like plumage, examples of which occasionally occur, will be found in Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 581.

153. Coot (*Fulica atra*).

Although less abundant than formerly this species is still frequent on the Broads, and is generally distributed, being found even in small pieces of water if affording the required shelter of reeds and dense aquatic vegetation.

154. Crane (*Grus communis*).

The following is believed to be a complete list of the modern occurrences in Norfolk of this accidental visitant, which it is likely enough bred in this county in olden days:—Feltwell, August 1836; Martham, February 1850; Warham, spring 1865; (?) Somerton and Thornham, May 1869; Pickenham, June 1869; Wretham, September 1873. Mr. Stevenson has collected such ancient references to this bird as refer to Norfolk, and the subject has been further pursued by Mr. J. E. Harting in the 'Field' for December 23rd, 1882.

155. Great Bustard (*Otis tarda*).

Norfolk, as the county in which the native race survived longest, will always be associated with the memory of this magnificent bird; but it must be understood that it was only in what Sir Thomas Browne called the "champian and feildy part" that is to say, the open country from Thetford to beyond Swaffham, between the low lands on the west, and the enclosed or wooded portions of the middle of the county—that the Bustard found a suitable home. Here it was "not unfrequent" in his time, and existed in numbers perhaps not much reduced until about the beginning of this century; but soon after there began a rapid decrease from causes set forth at length in Mr. Stevenson's 'Birds of Norfolk,' to which we refer our readers, and here need only repeat that 1838 was the last year in which examples of the old race are known to have survived. Of this race our Museum fortunately possesses four specimens, three killed in Norfolk and one in Suffolk.*

Since the extirpation of its ancient breed, England is from time to time visited by stragglers of this species from the continent, and the last Norfolk occurrence was in January and February, 1876, when a male bird frequented some fen-land chiefly in the parish of Hockwold, below Brandon, for about a month, and finally departed unharmed, thanks to the exertions of Mr. H. M. Upcher and some

* The first mention of the Bustard as a Norfolk bird with which we are acquainted is quoted by Mrs. Herbert Jones ('Sandringham Past and Present,' p. 23) from the 'Chamberlain's accounts' preserved among the Corporation Records of King's Lynn, by which it appears that in the 44th of Edward III. (1371) 39s. 8d. was paid "for Wine, *Bustards*, Herons, and Oats, presented to John Nevile, Admiral."

other gentlemen, who thereby set an example that might well be more generally followed.*

156. Little Bustard (*Otis tetrax*).

This species has been known to occur in Norfolk sixteen times including the first recorded specimen in November, 1820 (Trans. Norfolk and Norwich Nat. Soc. vol. ii. pp. 19, 22), always in winter plumage. It may be well to mention that the date of Mr. Sparshall's specimen ('Birds of Norfolk,' vol. ii. p. 43) should, as suggested by Mr. Stevenson, be December 3rd, 1833, and not 1835, as entered in the Norwich Museum presentation book. There is a record of its occurrence in the 'Norfolk Chronicle' for December 14th, 1833.†

157. Stone Curlew (*Œdicnemus scolopax*).

A well known summer migrant. After becoming gradually less numerous in its old haunts and disappearing from many localities where it formerly nested, this fine species is again increasing in numbers and returning to several localities where it has not been known for many years.—S.

158. Collared Pratincole (*Glareola pratincola*).

Of the Pratincole Mr. Stevenson gives three occurrences ('Birds of Norfolk, vol. ii. p. 64), and a fourth was shot at Feltwell in June, 1868 ('Zoologist,' 1869, p. 1492).‡

159. Dotterel (*Eudromius morinellus*).

Passing trips visit us in spring and occasionally a few in autumn, but this interesting bird is much less common on both sides of the county than was formerly the case.

* An account of this incident, and of the interesting, but unfortunately unavailing, attempt to secure the stay of the visitor by liberating a hen Bustard kindly supplied by Lord Lilford, is contained in the 'Field,' 8th April, 1876.

† At the same time one was killed in Kent, one in Oxfordshire, and another in Scotland.

‡ Mr. Thomas Boynton has in his collection, at Bridlington Quay a pair of Pratincoles obtained from Dr. W. W. Boulton, of Burnley, which he states were shot off the breakwater near Yarmouth in November, 1810, by Mr. Hunt, a schoolmaster of that town. Notwithstanding the discrepancy of the alleged date, it may possibly be that these were the birds known to have been killed in May 1827, as stated by several authorities and which Mr. Stevenson was unable to trace. Mr. Gurney, however, who has examined them, is of opinion that their appearance is not in favour of their being British specimens.

160. Ringed Plover (*Ægialitis hiaticula*).

This species is present with us at all seasons, breeding in several suitable localities along the coast, and receiving additions in autumn, when those which have nested here probably move south. The Ringed Plover still breeds in reduced numbers on Thetford Warren, also on some of the "Brecks" on the Norfolk side the border, arriving in February and departing late in August. Individuals of the small race with the darker mantle have occurred at Yarmouth.—S.

161. Kentish Plover (*Ægialitis cantiana*).

A summer visitant to our line of shore, doubtless occasionally mistaken for the Ringed Plover in its immature plumage. In the autumn of 1881, Mr. Stevenson recorded as many as six (Trans. Norfolk and Norwich Nat. Soc. vol. iii. pp. 551–553), and a good many others on different occasions have been noted, generally at Yarmouth.

[8. Eastern Golden Plover (*Charadrius fulvus*).

In December, 1874, Mr. Edward Bidwell detected an example of this Asiatic Plover in Leadenhall Market, said to have been sent from Norfolk (*cf.* 'Ibis,' 1875, p. 513). That it was killed somewhere in England is highly probable. It is said to have been taken three times in Heligoland, and several times in Malta.]

162. Golden Plover (*Charadrius pluvialis*).

A few Golden Plover arrive in this county very early in the autumn, having been met with in the end of July and middle of August; but it is not till late in September that they appear in any numbers, thence throughout the winter they are to be met with in flocks; but Mr. Stevenson ('Birds of Norfolk,' vol. ii. p. 67) is of opinion, in support of which he quotes the experience of several old sportsmen, that they occur in less numbers than formerly. On the return migration, they have been met with in this county late in April, or even in May, in full breeding plumage; but this must not be taken as an indication of their breeding here, and this remark applies equally to several other Waders, for instance, the Grey Plover, Dunlin, and Godwit.—S.

163. Grey Plover (*Squatarola helvetica*).

A spring and autumn migrant, commoner than in most counties, seldom found far away from the mud-flats, which have an irresistible attraction for this species. Many examples which pass northwards along the coast in May are in perfect nuptial plumage.

164. Lapwing (*Vanellus vulgaris*).

Still a common resident, but the individuals which winter with us are probably seldom those which were here in summer. They are much affected by hard weather.

165. Turnstone (*Strepsilas interpres*).

A spring and autumn migrant: very common at these seasons at Blakeney; less so at Yarmouth. Like the Sanderling, it is very tardy in seeking its summer quarters, and is occasionally seen on our coast as late as the month of June. It is questionable whether these very late birds breed at all.

166. Oystercatcher (*Hæmatopus ostralegus*).

This species is very abundant in the Wash in winter; but neither in winter nor autumn is it very common on the remaining portion of the coast. A few pairs still nest in one or two favoured localities on our coast, but it is doubtful if any succeed in rearing their young.

167. Avocet (*Recurvirostra avocetta*).

In one of Mr. Rising's notes he says: "In 1814 there were many [Avocets] bred in Horsey. I have found more than six nests in a day, they left altogether after 1824." Writing in 1824, Mr. Lubbock says: "Within the last twelve years the Avocet was plenty at Horsey, seventy or eighty pairs bred there every year; but the bird at the present time is almost unknown there." I have other evidence of its nesting at Horsey in 1816 and 1818. A large colony also existed at Salthouse; in 1853, a marshman named Keymer assured me that "years ago" they were very numerous, and that he took many of their eggs every season. Mr. J. H. Gurney was informed that this colony was exterminated in consequence of the demand (especially at Newcastle) for Avocets' feathers, for the purpose of dressing artificial flies. This would be about the year 1820. At present this species is an

occasional visitant, scarcely a spring or summer passing without one or more pairs being seen or procured, mostly on Breydon.*—S.

168. Black-winged Stilt (*Himantopus candidus*).

An accidental spring and summer visitant: twelve instances are recorded of its occurrence in this county, for most of which Ornithologists are indebted to Mr. Stevenson.

169. Grey Phalarope (*Phalaropus fulicarius*).

An occasional winter visitant, sometimes obtained with the pure grey back, in which state of plumage it is very rarely met with in the large flocks which occasionally visit the south coast of England.

170. Red-necked Phalarope (*Phalaropus hyperboreus*).

Prior to 1870 this species was rarer in Norfolk than the Grey Phalarope, but, since then, it appears from Mr. Stevenson's records to have occurred the oftener of the two, but almost always in immature plumage, and generally in autumn.—G.

171. Woodcock (*Scolopax rusticola*).

A common autumn and winter visitant, some remaining to breed nearly every year. This species varies greatly in numbers, and, moreover, continues to receive additions from October, when they first appear, to the end of January. That this is the case with many other migrants from Scandinavia, whose habits have been less studied, is exceedingly probable. White and pied varieties occasionally occur, and a remarkable melanism was shot at Runton in November, 1869.

172. Great Snipe (*Gallinago major*).

The Great Snipe has been killed many times in this county, Mr. Stevenson terms it a regular autumn visitant, but he has only once known it to occur in this county in spring.

173. Common Snipe (*Gallinago cœlestis*).

A common resident, receiving migratory additions in autumn when the majority of our home-bred birds move southward. The variety known as "Sabine's" Snipe occurred at Rainham in 1856.

* Whilst this sheet is in the press we have heard of the usual spring slaughter of Avocets on Breydon, where a small flock of six appeared on May 4th, only to fall victims to the insatiable greed of the "collector," by whom the local gunners are bribed by the offer of very high prices to violate a most salutary Act of Parliament.—S.

174. Jack Snipe (*Gallinago gallinula*).

An autumn and winter visitant. We have not the least reason to believe this bird has bred in Norfolk, although it has stayed with us as late as the month of July, and has been shot or seen in perhaps every month of the year.

175. Red-breasted Snipe (*Macrorhamphus griseus*).

This rare straggler from America has occurred three times, viz., in October, 1836, in October, 1841,* and in October, 1845. The last-named specimen passed from the collection of the late Mr. Rising, by whom it was killed, to the Norwich Museum.

176. Broad-billed Sandpiper (*Limicola platyrhyncha*).

Has been shot on Breydon Broad three times, viz., on May 25th, 1836, on May 25th, 1856, and on April 23rd, 1858 ('Zoologist,' p. 6096).

177. Pectoral Sandpiper (*Tringa maculata*).

The first British specimen was killed on Breydon Broad in October, 1830, and a figure is given of it in Babington's 'Birds of Suffolk' (plate iv.). Since that time three more have occurred, of which the last was caught in the Wash, in the nets which are there in use for catching Plover, Dunlin, Curlew, etc., on January 9th, 1868 ('Zoologist,' 1868, p. 1128); a very singular time of year for such a bird.—G.

178. Dunlin (*Tringa alpina*).

This is the most abundant of all our migratory Waders, occurring in spring and autumn on our mud-flats, and receiving large additions to its numbers in the winter months. Specimens may be met with in almost every month of the year, but it does not breed with us, though late spring birds and early autumn arrivals are frequently in full plumage.—S.

* There having been some misapprehension about the 1841 Red-breasted Snipe, it may here be stated that it never formed part of Stephen Miller's collection; my father heard of its occurrence, and requested a birdstuffer named Johnson to go to Yarmouth and buy it for him, which he did, and brought it back *in the flesh*, and it is now stuffed and in good preservation at Northrepps Hall. Another was sold at Stephen Miller's sale (lot 36), but there is no proof that it was British-killed.—G.

179. Little Stint (*Tringa minuta*).

The Little Stint is occasionally almost abundant on the mud-flats and pools of our harbours in autumn, particularly in September, the examples so obtained being almost always young birds; but both in the spring and early autumn migrations of this species examples are obtained in full breeding plumage.

180. Temminck's Stint (*Tringa temmincki*).

May be termed a spring and autumn visitant, though always one of our rarer Sandpipers. Mr. Stevenson has recorded far more at Yarmouth or in its vicinity than anywhere else, one occurrence there being as late as November 23rd. Though some fine adults have been obtained it has been most often shot in immature plumage.

181. Curlew Sandpiper (*Tringa subarquata*).

This pretty frequenter of our tidal harbours, once thought so rare, is sometimes quite common in September, the examples then obtained being nearly always immature. At that season its numbers vary as much as the Little Stints do, both being very rare one autumn and perhaps very common the next. Norfolk has produced at different times at least thirty Curlew Sandpipers well advanced in red nuptial plumage, but never one in the adult winter garb.—G.

182. Purple Sandpiper (*Tringa striata*).

The Purple Sandpiper is very rare in winter and spring, but is not uncommon on certain portions of the coast in autumn. Some of the examples obtained then have been very immature, one even retaining a little down on the head and neck.

183. Knot (*Tringa canutus*).

The Knot used to be a very common bird at Blakeney, but is now much rarer, yet every autumn many still come to all our mudflats; and again late in spring splendid birds in the red nuptial plumage are to be seen at Breydon and elsewhere. Comparatively few remain throughout the winter. No Sandpiper is more migratory, and none strike against the floating light-vessels on our coast more frequently.

184. Sanderling (*Calidris arenaria*).

Sanderlings visit the Norfolk coast, more particularly the shores of the Wash and Breydon, in considerable numbers every autumn, arriving early in August, and are found, although in much smaller numbers, all through the winter. In the spring migration they are occasionally met with as late as the end of May or beginning of June, when they are in perfect breeding plumage.—S.

185. Ruff (*Machetes pugnax*).

The Ruff formerly nested at Hockwold and Feltwell Fens, as well as in the Broad District, but has long ceased to breed in the former localities. Much information as to the gradual approach to extinction of this species as a summer resident will be found in Lubbock's "Fauna of Norfolk" (Edit. 1879). It is not improbable that a pair or two still nest almost every season, as was certainly the case in 1884 and 1886, in one favourite locality, but it is doubtful whether either birds or eggs escape.—S.

186. Buff-breasted Sandpiper (*Tryngites rufescens*).

This accidental straggler from America has occurred three times at Yarmouth and once at Sheringham: the latter is said to have been killed in July, a very unlikely month.—G.

187. Common Sandpiper (*Totanus hypoleucus*).

A spring and autumn migrant, rarely occurring in summer, and not *known* to have bred in this county; though Mr. F. Norgate has reason to believe a pair did so at Downham or Santon in 1884, and its repeated occurrence in the summer-time has been noticed by many observers.

188. Green Sandpiper (*Totanus ochropus*).

Commonest in the autumn, but to be met with at all seasons both inland and by the coast. The eggs of the Green Sandpiper have never been found in this county, though carefully looked for by those who were well aware of its arboreal nesting habits. The mud of a lake or a mill dam from which the water has been let off is very attractive to this species, doubtless from the plentiful supply of food to be then obtained.

189. Wood Sandpiper (*Totanus glareola*).

A spring and autumn migrant. A very juvenile example—in fact, not having nearly lost all its down—was taken at Beachamwell many years ago. A woodcut, but a very poor one of it, will be found in the 'Zoologist' for 1846 (p. 1324).

190. Redshank (*Totanus calidris*).

Is still common, and an inland breeder, but there are several good places for them on the coast between Salthouse and Lynn. The autumnal accessions are probably less in the case of the Redshank than in most of its class.

191. Spotted Redshank (*Totanus fuscus*).

Not uncommon in immature plumage, and also sometimes occurring in the nuptial dress. Mr. Stevenson has seen more in spring than in autumn ('Birds of Norfolk,' vol. ii. p. 204).

192. Greenshank (*Totanus canescens*).

A spring and autumn migrant by no means uncommon at such places as Breydon, Blakeney, Wells, and Burnham, the examples obtained at the latter season being almost all young birds. It is never seen in winter.

193. Black-tailed Godwit (*Limosa belgica*).

Has long ceased to breed in Norfolk, and now only occurs as a spring and autumn migrant. A note in the late Mr. Rising's copy of Yarrell is as follows: "I shot a pair [of Godwits] in 1829 which had a nest in Braidens," a marsh at Horsey.—S.

194. Bar-tailed Godwit (*Limosa lapponica*).

A spring and autumn migrant to our shores. Occasionally abundant where mud-flats are uncovered at low tide.

195. Curlew (*Numenius arquata*).

To be found at almost all seasons of the year along our coast where there are mud-flats to feed on at low tide, but commonest in spring and autumn.

196. Whimbrel (*Numenius phæopus*).

Common on Breydon, as also at Blakeney, more particularly in the spring and autumn.

197. Black Tern (*Hydrochelidon nigra*).

At the commencement of the present century this bird bred in great numbers both in the Fens and Broads of Norfolk. After having been long extinct in Hockwold and Feltwell Fens, in the year 1853, after an extensive flood, three pairs again nested in that neighbourhood. Mr. Stevenson states that the last nest he knows of in Norfolk was taken at Sutton in 1858. At present the species occurs in small numbers generally in April, August, and September each year, and would doubtless breed if not invariably shot.—S.

198. White-winged Tern (*Hydrochelidon leucoptera*).

A white-winged Tern—the first recorded in England—was killed at Horsey in May, 1853, it was with another individual of the same species in company with fifteen or twenty Black Terns; another, in Mr. Stevenson's collection, was shot at Hickling, in June, 1867. In May, 1871, four were killed by Mr. E. T. Booth, at Breydon, and in May, 1873, he shot five, and saw several more at Hickling. In June, 1883, two were seen at Barton, and one of them (killed on the 10th at Hickling) is now in Mr. R. W. Chase's collection at Birmingham.

199. Whiskered Tern (*Hydrochelidon hybrida*).

A Whiskered Tern—the second killed in Britain—was shot on Hickling Broad in June, 1847; and is at present the only known occurrence of this species on the east coast of England. It was a female, and contained an egg almost ready to receive the shell.

200. Gull-billed Tern (*Sterna anglica*).

The Gull-billed Tern was only admitted with very great doubt in Gurney and Fisher's list of Norfolk Birds. Shortly after, viz., in 1849, one was obtained in the spring, one in the summer, and two in the autumn. The following year another was obtained, and the next year another. No more occurred until 1878, when two were shot, as recorded by Mr. T. E. Gunn ('Zoologist,' 1880, p. 53). The pair in my father's collection I have no doubt are the two which were shot together in the autumn of 1849, at Yarmouth, where all the others were taken.—G.

201. Caspian Tern (*Sterna caspia*).

Has occurred nine times at or in the vicinity of Yarmouth. The following are the correct dates as far as can now be ascertained:—October, 1825, immature; no date, adult; 1839, adult; no date, immature; June, 1849, adult female; June, 1850, adult male; July, 1850, adult; August, 1851, adult male; May, 1862, adult male.—G.

202. Sandwich Tern (*Sterna cantiaca*).

A spring and autumn migrant, decidedly rare, which is remarkable as there is a large colony at the Fern Islands on the coast of Northumberland. It is very likely that in former days it bred on our coast, as it did in Latham's time on the coast of Suffolk.—G.

203. Roseate Tern (*Sterna dougalli*).

As there is evidence that this species was formerly commoner in the British Isles than it is now, it is probable the Messrs. Paget were right in including it in their "Birds of Yarmouth." A Roseate Tern was seen "very close" by Mr. E. T. Booth, on Breydon Broad, May 26th, 1871 ('Rough Notes,' pt. xi.), and another was shot by Mr. G. E. Hunt, at Hunstanton, in July, 1880. These are the only recent occurrences recorded.—G.

204. Common Tern (*Sterna fluviatilis*).

Many years ago this species nested in large numbers, according to a note in the late Mr. Lubbock's copy of "Bewick," on the islands in Hickling Broad; at present it is much more restricted in its breeding haunts, and far less numerous than formerly.—S.

205. Arctic Tern (*Sterna macrura*).

A summer visitant; much rarer with us than the common Tern. It is supposed to have bred at Blakeney (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 408), but proof is wanting.

206. Lesser Tern (*Sterna minuta*).

A summer migrant; breeding with us in reduced numbers. Mr. Lubbock states that this species as well as the common Tern formerly bred on an island in Hickling Broad.—S.

207. Sabine's Gull (*Xema sabinii*).

Two young Sabine's Gulls, male and female, the only known Norfolk specimens, were shot on Breydon Broad, in October, 1881 (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 373), one of which passed into the collection of Mr. Stevenson, and the other into that of Mr. Connop.

208. Little Gull (*Larus minutus*).

An accidental visitant, and prior to 1870 a very rare one. In February of that year a tremendous gale from the east blew a whole flock to the east coast of England. Mr. Stevenson considers that over sixty were killed in Norfolk (Trans. Norfolk and Norwich Nat. Soc. 1870-1, p. 68), the majority of these were in adult plumage, others in different stages of immaturity. In the breeding plumage it has never occurred.

209. Mediterranean Black-headed Gull (*Larus melanocephalus*).

On the 26th December, 1886, an adult male of this southern species was killed on Breydon, and came into the possession of Mr. George Smith, of Great Yarmouth, where it was seen in the flesh both by Mr. Gurney and myself. On the 18th January, 1887, Mr. Howard Saunders exhibited the skin at a Meeting of the Zoological Society of London.—S.

210. Black-headed Gull (*Larus ridibundus*).

This is the only Gull which nests in Norfolk; there is a large colony at Scoulton,* another at Hoveton. Of late years the birds at the latter Gullery have been very unsettled, and small parties have set up detached breeding places in various other localities, none of which, I believe, have been permanent.—S.

211. Common Gull (*Larus canus*).

Common, especially on the coast in autumn, when we regularly see a constant succession of Gulls of different kinds flying against the wind. All birds fly against wind by preference, but in none is

* There are three beautiful plates by Keulemans of Scoulton Mere and its Gulls in the second volume of Rowley's 'Ornithological Miscellany,' p. 407, and an excellent description of the same Gullery by Mr. Stevenson in the Trans. Norfolk and Norwich Nat. Soc. 1871-2, p. 22.

it so noticeable as in the Gull tribe. Vast numbers, in dread of being swept away before our autumn gales, are seen fighting against them in the autumn, generally in October and November.*—G.

212. Herring Gull (*Larus argentatus*).

Common, especially in immature plumage, when it is difficult to distinguish it from the young Lesser Black-backed Gull, though the present species is not so dark in appearance.

213. Lesser Black-backed Gull (*Larus fuscus*).

Common, especially in immature plumage, and in the autumn, along the coast, but seldom seen far inland. This Gull and the preceding seem to be about equally abundant.

214. Great Black-backed Gull (*Larus marinus*).

Common, especially in autumn, along the coast, but seldom seen inland, and never so abundant as the previous two species.

215. Glaucous Gull (*Larus glaucus*).

Not uncommon in winter, though rare in adult plumage. In January, 1881, a great many were brought into Yarmouth by the fishing-smacks; at the same time several were shot opposite Yarmouth Beach and on Breydon Broad. It is impossible to say how many were actually killed, but from the information I have collected it appears that from forty-five to fifty were offered in the flesh for sale in the town.—G.

216. Iceland Gull (*Larus leucopterus*).

An accidental winter visitant, far rarer than the Glaucous Gull. A young female, in the possession of Mr. G. Smith, of Yarmouth, was shot on Caistor Beach in November, 1874. It has been examined and its identity confirmed by Mr. Howard Saunders.

217. Kittiwake Gull (*Rissa tridactyla*).

A spring and autumn visitant, also occurring in smaller numbers at other seasons. The adult seems commoner than the young, which is the reverse of what is the case with the other Gulls.

* In severe winters, and in early spring before going northwards, this species comes far inland, and frequents ploughed lands like the Black-headed Gull.

218. Great Skua (*Stercorarius catarrhactes*).

An accidental visitant, occasionally not uncommon out at sea in autumn, when examples are shot from boats engaged in the Herring fishery. The Messrs. Paget mention four shot in Yarmouth "roads" as long ago as October, 1827. Mr. Stevenson recorded eight in October, 1857, and several in October, 1858 ('Zoologist,' p. 6309), a few others will be found mentioned from time to time in his annual notes, which have for the most part occurred in the autumn.—G.

219. Pomatorhine Skua (*Stercorarius pomatorhinus*).

This species has long been known on our coast: my father has a drawing of one taken at Northrepps or Overstrand in October, 1822, which must have been one of the earliest in this country. In October, 1879, over a hundred were shot: Mr. Stevenson has given an interesting account of this immigration and the causes which led to it (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 99).*—G.

220. Arctic or Richardson's Skua (*Stercorarius crepidatus*).

This bird is often to be seen in autumn, generally in immature plumage. It is essentially a bird of the sea, but is occasionally met with inland.

221. Long-tailed or Buffon's Skua (*Stercorarius parasiticus*).

An autumn visitor, scarcer than either of the two preceding. Some fine adults were obtained in October, 1879, when the Pomatorhine Skuas were so abundant. In immature plumage it is extremely difficult to distinguish from Richardson's Skua, and may therefore be more frequent than is supposed.—G.

222. Fulmar Petrel (*Fulmarus glacialis*).

Fulmars, except when storm driven, are seldom met with inshore. They are not unfrequently brought into Yarmouth by the smacksmen, and Mr. George Smith records (Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 223) fifteen thus obtained between October, 1878, and December, 1885. In October, 1879, four occurred on our coast (Stevenson, 'Zoologist,' 1879, p. 340), and great numbers were also seen at Heligoland.

* For further particulars of these storm-driven Skuas met with over the entire eastern coast, see Trans. Glasgow Nat. Hist. Soc. April 27th, 1880; Trans. Berwick Nat. Club, 1879; and 'Zoologist,' 1880, p. 18 *et seq.*

223. Capped Petrel (*Œstrelata hæsitata*).

In the spring of 1850, a Capped Petrel, the only British specimen on record, was caught alive on Southacre heath, near Swaffham, and is now in Mr. Newcome's collection. Only two other European specimens are known—one in France and the other in Austria.—G.

224. Sooty Shearwater (*Puffinus griseus*).

On the 25th of July, 1851, I purchased one of these birds, which had been taken asleep on the water near Lynn; it lived five days in my possession, and is now in the Lynn Museum. At the time it was recorded as the Cinereus Shearwater (*Puffinus cinereus*), see Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 174.—S.

225. Manx Shearwater (*Puffinus anglorum*).

The Manx Shearwater, as might be expected, is rare. Wanderers occasionally lose their way and are picked up inland, and now and then a few are seen off the coast in autumn, as in September, 1880, when the Messrs. Power met with some off Blakeney.

226. Dusky Petrel (*Puffinus obscurus*).

A specimen of this rare bird—the only recorded British example—was found dead at Earsham in April, 1858. The back and one foot had been a good deal nibbled by a Rat or Mouse, but it did not appear to have been long dead.

227. Forked-tailed Petrel (*Cymochorea leucorrhoa*).

From a list of occurrences communicated by Mr. Stevenson to Dresser's 'Birds of Europe' (vol. viii. p. 498), it appears that the Fork-tailed Petrel has occurred in Norfolk about twenty times, and that 1867 produced seven (*cf.* 'Zoologist,' 1868, p. 1099), one of which was in July. In the autumn of 1883, Mr. J. Nicholas, the Master of the Hasborough light-vessel, sent me a wing of this Petrel.—G.

228. Storm Petrel (*Procellaria pelagica*).

Half-starved Storm Petrels are sometimes found on our shores, or inland, and I have had several on different occasions from our light-vessels. In the winter of 1867-8, a number of Storm Petrels and six Fork-tailed Petrels occurred at Lynn (*cf.* Dresser, 'Birds of Europe,' vol. viii. p. 499). In the following November they were again plentiful, when they were also very abundant at Heligoland (*cf.* Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 56).—G.

229. Razorbill (*Alca torda*).

For about eight months of the year the Razorbill is fairly common in the tideway of the open sea, though probably always less abundant than the Guillemot. It seldom, however, approaches the shore or harbours.

230. Common Guillemot (*Alca troile*).

Occasionally large numbers of this and the preceding species are washed ashore exhausted or dead after bad weather; this was notably the case on one occasion in May, 1856, when the whole shore, from Mundesley to Cromer, and doubtless farther still, was lined with their dead bodies. Gulls are sometimes found under similar circumstances, but in fewer numbers. On the 23rd of March, 1883, after a series of severe gales from the north and east, in addition to Puffins and Razorbills, I found washed up on the shore at Cromer a Red-throated Diver and a Kittiwake.—S.

[9. Ringed Guillemot (*Alca lacrymans*).

Has been killed thrice at least at Yarmouth, twice at Cromer, and once at Cley: this latter, obtained in November, 1885, was a very immature bird, with the beak not fully grown. It is regarded by most Ornithologists as a variety, but no example has ever been met with with the ring or bridle incomplete,—and this in spite of proved hybridism with the Common Guillemot.—G.]

231. Black Guillemot (*Uria grylle*).

In the winter of 1866-7, Mr. T. E. Gunn recognised two Black Guillemots which had been killed off Wells. About the same time I obtained an example from Blakeney, and in the following winter heard of another at Yarmouth (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 135). These were in immature plumage, but an adult was washed ashore, with other starved *Alcidæ*, in March, 1875, at Caistor, as noted by Mr. Stevenson (Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 207).—G.

232. Little Auk (*Mergulus alle*).

This bird of the ocean is not rare in winter, and has been often found inland. What is far more remarkable is that it has occurred three times in breeding plumage,—at Wells (Stevenson, 'Zoologist,' 1857, p. 5758), near Lynn ('Zoologist,' 1872, p. 3228), and at Surlingham (*l.c.*),—and once if not oftener in a state of change.

233. Puffin (*Fratercula arctica*).

The Puffin is certainly not a common bird, at least near the shore. Occasionally an example is picked up inland, and after continued rough weather, dead ones are sometimes found on the beach, both adult and immature. Six have occurred at different times in March, and several in May, but after that they have left us for their breeding places, the nearest of which is at Flamborough Head: though some have been seen by Mr. Southwell in Yarmouth "roads" in summer. On the whole they are not nearly so common as might be expected, remembering the great numbers which now resort annually to the bird-nursery just named.—G.

234. Great Northern Diver (*Colymbus glacialis*).

Is not uncommon at sea in the winter, but has not occurred in the breeding plumage as far as we can ascertain. Mr. Stevenson has recorded one as far inland as Tomston Mere, near Watton (Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 216), and Mr. Gunn another on Surlingham Broad ('Naturalist,' 1867, p. 83).

235. Black-throated Diver (*Colymbus arcticus*).

Not much rarer than the Great Northern Diver, and some have been shot which had in great part assumed breeding plumage; but no example has ever been obtained in quite complete attire.

236. Red-throated Diver (*Colymbus septentrionalis*).

More frequent than either of the preceding, and is found at sea at most seasons of the year. In October, 1880, an extraordinary migration was witnessed off Cley by the Messrs. Power: the Divers were a quarter of a mile from the shore, and were going south-east in a constant stream for nearly four hours (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 349). One obtained is said to have had a perfect red throat, but I have never seen a Norfolk one *really* in complete plumage. Mr. Gunn informs me that six were sent him to be stuffed in October, 1865, killed in the county, all in nearly full breeding attire: some particulars of their plumage are given by Mr. Stevenson ('Zoologist,' 1866, p. 85), and by Mr. Gunn in 'The Naturalist' (ii. 297). In a state of change it has been shot more frequently.—G.

237. Great Crested Grebe (*Podicipes cristatus*).

Lubbock speaks of this noble bird as very numerous, and the greatest ornament of the Norfolk Broads. In 1822, after referring to the large number of its eggs which he had seen taken, and the hostility of the fishermen owing to its piscatorial propensities, he says: "I may live to see the day when, even in Norfolk, it is almost extinct." This prediction was in a fair way towards being accomplished previous to the close time enactment, but, thanks to this salutary check, it is still the "chief ornament of the Broads;" and is found in many other pieces of water in different parts of the county. The breeding birds, on their arrival in the month of March, are generally accompanied by a number of migrants, which pass on probably to breed further north.—S.

238. Red-necked Grebe (*Podicipes griseigena*).

Rarer than the previous, and more marine. This species has never been proved to breed in Norfolk, although it has more than once been met with in full breeding plumage.

239. Sclavonian Grebe (*Podicipes auritus*).

By no means uncommon in winter, but very rare in nuptial plumage. Mr. Stevenson says it has oftenest occurred in February (Dresser, 'Birds of Europe,' vol. viii. p. 646).

240. Eared Grebe (*Podicipes nigricollis*).

Rare. Mr. Stevenson enumerates no less than twenty-five specimens in full, or nearly full, breeding plumage, as against two obtained in the winter (Dresser, 'Birds of Europe,' vol. viii. p. 651); but a few have been obtained at the latter season since his notes were written.*

241. Little Grebe (*Podicipes fluviatilis*).

Fairly common at all times, but decidedly migratory. They probably come to Norfolk in October, but their arrival is not often noticed.

* Mr. E. T. Booth ('Rough Notes,' part xii.) speaking of the probability of this species having been a not unfrequent visitor, in the breeding season, "in days gone by to several of the Broads in the Eastern Counties," states that although he had never seen it alive in summer, "a full-plumaged adult and a couple of downy mites" were brought to him by a marshman. He does not remember either the date or the precise locality, but by letter informs us that it was in the county of Norfolk.

242. Cormorant (*Phalacrocorax carbo*).

The Cormorant is rather rare with us, the adult bird especially; but is sometimes seen on the coast, generally in autumn. Sir Thomas Browne, writing about 1663, says: "Cormorants; building at Reedham, upon trees, from whence King Charles the First was wont to be supplied." Doubtless Charles used them for fishing, and probably he kept them in the ponds which James I. had made for that purpose on the site of the Houses of Parliament. It is to be regretted that we do not know at what date this species ceased to breed at Reedham.—G.

243. Shag (*Phalacrocorax graculus*).

The Shag, or Crested Cormorant, is rarer than the Cormorant. Messrs. Gurney and Fisher say that it generally occurs in autumn, and in immature plumage; but since these remarks were written, two or three exceptionally fine full-plumaged examples have been obtained, perhaps the finest being one in the late Mr. Master's collection, which was obtained at Yarmouth.

244. Gannet (*Sula bassana*).

Often to be seen fishing along our coast in autumn, and occasionally in the height of summer (*cf.* 'Zoologist,' 1872, p. 3226). The immature bird is not very common, but an intermediate piebald state of plumage sometimes occurs. Examples are occasionally picked up inland, or found dead on the beach after protracted rough weather. We have heard of four or five at different times allowing themselves, though evidently unwounded, to be caught by fishermen on the water.

[10. Pelican (*Pelecanus onocrotalus*).

Sir Thomas Browne makes two allusions to a Pelican shot on Horsey Broad, May 22nd, 1663, but he adds that about the same time one escaped from St. James' Park, London; it may not, however, have been the same, for the Broads at that time were extensive enough to attract any rare water birds, and May is just the migratory month when a southern species would be most likely to occur. In the summer of 1871 the humerus of a Pelican was found in the peat of Feltwell Fen, and was exhibited at a meeting of the Zoological Society on the 5th of December following, by Professor Newton. It is now in the Museum of Zoology at Cambridge.]—G.

245. Heron* (*Ardea cinerea*).

Our principal Heronries are at Didlington, Gunton, and Earlham; the first of these was formerly at Feltwell Fen, whence the birds removed to Didlington some eighty years ago (*cf.* Stevenson, 'Birds of Norfolk,' vol. ii. p. 132). A list of the Norfolk Heronries will be found in Lubbock's 'Fauna of Norfolk,' edit. 1879, pp. 85, 222; to this must be added a thriving establishment in Kimberley Park, but I hear that the Heronry at Mautby is now reduced from one hundred nests to about twelve. Lubbock mentions that detached pairs occasionally nested amongst the reeds in the most inaccessible parts of the Fens.—S.

246. Purple Heron (*Ardea purpurea*).

In the 'Birds of Norfolk' details are given of ten occurrences prior to 1835; but there is a certain degree of doubt about some of them. One long-forgotten example, which is probably identical with one of those enumerated, is recorded in the 'Norfolk Chronicle' of January 31st, 1835, as killed at Hunstanton. The following are all the occurrences of recent years as recorded by Mr. Stevenson and others:—Hoveton, July, 1862; Ludham, October, 1865; Horning, December, 1871; Hingham, September, 1875; Ranworth, November, 1876; Yarmouth, October, 1878; Beccles, September, 1882. None of them have been in adult plumage.—G.

247. Squacco Heron (*Ardea ralloides*).

This rare Heron has been known to occur in Norfolk in only a few instances, all, with the exception of one doubtful date, being in the summer months. The only recent occurrence was a beautiful adult male at Surlingham on 26th June, 1863, now in Mr. Stevenson's collection.—S.

248. Night Heron (*Nycticorax griseus*).

Has occurred twelve or thirteen times; only two appear to have been immature, but one of these (shot in July, 1880) was a very young example (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 407), apparently a bird of the year, yet there is no reason to suppose it was bred in this country.

* The Great White Heron, Little Egret, and Buff-backed Heron, were included in Mr. Stevenson's "Birds of Norfolk," but with the information which has since been obtained on the subject, it seems best not to retain them in the Norfolk list.

249. Little Bittern (*Ardetta minuta*).

Mr. Stevenson enumerates fourteen occurrences of the Little Bittern. There can hardly be a doubt of its having formerly bred in our extensive marshes, and there is even strong presumptive evidence of its having done so in two instances of recent years.

250. Bittern (*Botaurus stellaris*).

This is another of the birds which drainage and enclosure have driven from their old haunts. Evidence of the former abundance of the Bittern in the Broads and Fens of Norfolk is plentiful enough. Mr. Lubbock records that in 1819 he killed eleven Bitterns whilst Snipe shooting, without particularly looking for them, and that an aged keeper assured him in 1843, that when a boy, he has known a party "fen-shooting" at Downham to kill twenty or thirty Bitterns in one morning. The nesting of this bird was always more apparently rare than in reality, and so impenetrable was the situation chosen, that the eggs were seldom, even at that time, found, and the only indication of their having nested was the young birds being caught by retrievers. In Salmon's diary, under date 4th June, 1834, occurs the following entry:—"Went into y^e^ [Norwich] Museum, there are four young Bitterns about a week old in a nest placed amongst reeds, &c., these were obtained from between Norwich and Yarmouth, a proof that the bird still breeds in this county." The spring "boom" was generally first heard about the 15th March, the earliest out of nineteen observations mentioned by Marsham being February 20th, and the latest May 3rd. This call appears to have ceased probably when the female bird began to sit, Mr. Rising notes having heard one boom at Horsey "at Midsummer" as unusually late. In May, 1866, and again in the first week in March, 1867, the breeding note of the Bittern was heard at Hoveton. The last eggs were taken on 30th March, 1868, and on the 25th May of the same year a young bird was caught alive at the same locality. In the last week of May, 1886, the Bittern's boom was again heard at Sutton Broad, and subsequently in other localities in the same neighbourhood, and on the 10th August a young female Bittern, with the down still adhering to some of its feathers, was sent to Mr. Cole from Ludham, rendering it probable that the birds heard in the spring succeeded in bringing off young ones. As a winter migrant, the Bittern is not uncommon in this county.—S.

251. White Stork (*Ciconia alba*).

As an accidental spring and autumn straggler, it has occurred more times in Norfolk than in any other part of England.

252. Black Stork (*Ciconia nigra*).

This species has been met with in Norfolk on two occasions, first at Westacre in May, 1867, now in Mr. A. Hamond's collection, and subsequently at Breydon in June, 1877; the latter specimen passed from the late Mr. Rising's collection to the Norfolk and Norwich Museum.

253. Glossy Ibis (*Plegadis falcinellus*).

Very rare. Mr. Stevenson enumerates eleven specimens killed between the years 1818 and 1833, no other instance is recorded till September, 1868, when one was killed at Stalham, and on 16th September, 1881, another was shot on Wolverton Marshes, near Lynn. Mr. Lubbock says, on the authority of Mr. Girdlestone, that forty years before 1824 these birds were not so scarce as at present, being known to the gunners about Lynn as the "Black Curlew."—S.

254. Spoonbill (*Platalea leucorodia*).

In the seventeenth century Spoonbills, Herons, and Cormorants, all nested at, or near, Reedham, probably in the same colony, or close together. At the present day, the Spoonbill is an annual summer visitant, and it may probably be asserted that more have been seen on or near Breydon Broad in recent times than any place in the United Kingdom.—G.

255. Grey Lag Goose (*Anser cinereus*).

The Grey Lag Goose, though formerly breeding in the fens of the south-western part of the county, is now only a winter visitant, always rare, and often absent altogether, when the other kinds are found. Such as have been met with of late years have been chiefly shot at Yarmouth. Owing to the reclamation of marshes, the number of Geese and other Wild-fowl which come to us in winter is very much fewer than was formerly the case.

256. White-fronted Goose (*Anser albifrons*).

This bird, like the two following species, seems to prefer the extensive marshes and open country characteristic of North Norfolk and the country within reach of Breydon to the remaining portions of the county. The White-fronted Goose is by no means a common species here and very uncertain in its visits.

257. Bean Goose (*Anser segetum*).

Also a winter visitant of somewhat uncertain occurrence.

258. Pink-footed Goose (*Anser brachyrhynchus*).

Since this Goose has been distinguished from the preceding it has certainly proved to be the species most frequently met with in winter in the northern part of the county, being almost always found about Holkham, although rare at Yarmouth. Probably this species constituted the bulk of the large flocks which formerly visited the open country about Westacre, Wretham, &c., but at the present time is certainly the more frequent of the two.—S.

259. Red-breasted Goose (*Bernicla ruficollis*).

As this well-marked species has occurred on the east coast of England three times, we may fairly believe in the identification of one purchased in Yarmouth market in 1805 by Mr. L. Wigg, which he was informed was killed at Halvergate.

260. Bernacle Goose (*Bernicla leucopsis*).

A winter visitant, and almost an annual one: at the same time, according to my experience, it is the rarest of our Geese, and more than two or three are seldom shot in a season.—G.

261. Brent Goose (*Bernicla brenta*).

A winter visitant to our harbours; very uncertain as to numbers, depending greatly upon weather, but never so frequent at Yarmouth and Blakeney as in the Wash, where in the hard weather of 1870-1, when the frosts were long and severe, many were shot (Stevenson, 'Zoologist,' 1871, p. 2598).

262. Whooper (*Cygnus ferus*).

The Whooper appears upon our shores in greater or fewer numbers almost every winter, but is not so exclusively a hard weather bird as the next species. In January, 1871, they were very abundant, but since that time few have been met with. Although essentially winter visitors, they occasionally pass us late in the season; in 1880, one was killed at Yarmouth on the 10th of May.—S.

263. Bewick's Swan (*Cygnus bewicki*).

A winter visitant, rarer than the Whooper, but occurring under much the same conditions.—S.

264. Mute Swan (*Cygnus olor*).

This bird is now admitted to exist in a perfectly wild state in eastern Europe, and should it stray to England, the Norfolk coast would be particularly likely to attract any such wanderers. In a semi-domesticated state they are to be found on nearly all the Broads and Rivers of Norfolk, particularly on the Yare, and from the perfect liberty they enjoy, and the abundance of food, are very prolific. In 1881, a pair at Keswick brought off twelve Cygnets, eleven of which were reared; and a pair of birds on Surlingham Broad, in eight years, produced eighty-five eggs, from which they reared eighty-two Cygnets. At St. Helen's Hospital in Norwich there has for very many years existed a Swan-pit, in which large numbers of Cygnets from the neighbouring rivers and broads are annually collected for the purpose of fattening for the table. They are taken up in the second week in August, at which time one hundred or more Cygnets are frequently to be seen there. The late Governor of St. Helen's Hospital, who for more than thirty-five years had charge of the Swan-pit, assured me that during the whole of that time he had never seen a white Cygnet.—S.

265. Polish Swan (*Cygnus immutabilis*).

Since I first met with this Swan, at Lynn, in 1851, it has occurred many times in this county. I have stated my reasons for believing it to be a good species in the Trans. Norfolk and Norwich Nat. Soc. (vol. ii. p. 258 *et seq.*)—S.

266. Sheldrake (*Tadorna cornuta*).

A few still breed every year in three or four favourite localities on our west and north-west coast. These presumably go south in autumn, and those which are shot in winter are migrants from Scandinavia, and such as are seen in March are more likely on their way to Scotland and the north than to be our native birds returning to Norfolk. Doubtless the Sheldrake was once much commoner: Hunt alludes to it as one of the most plentiful of its genus (Stacy's 'History of Norfolk,' vol. i. p. 62). The Rev. William Whitear (joint author with the Rev. R. Sheppard of the 'List of Norfolk and Suffolk Birds') in his diary (now in the possession of his daughter, Miss Whitear) under date of May 26th, 1818, speaking of the Winterton, states that "the Sheldrake, which breeds there in the rabbit burrows, is not found there in the

winter, but that it is the first bird which comes in spring, making its appearance in February; that it used formerly to be in great abundance, but that they destroyed all they could on account of its disturbing the rabbits in their burrows."—S.

267. Wild Duck (*Anas boschas*).

Is still a common winter visitant, and also generally distributed in the breeding season. It lays in March, and by the middle of July the Flappers leave the Broads where they have been bred. A proper close time for them, in my opinion, is from March 1st to July 10th, but on this subject, which has been debated several times, a great difference of opinion exists among Norfolk Justices assembled at Quarter Sessions. For an account of the Decoys of Norfolk by Mr. Southwell, see Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 538.—G.

268. Gadwall (*Anas strepera*).

The native stock of this bird was reinforced about the year 1850 by turning down some pinioned birds (taken in a local Decoy) on two estates in West Norfolk, since which time it has become fully established as a resident, and has spread to other localities.—S.

269. Shoveller (*Spatula clypeata*).

Migrants not infrequently occur in winter, and are obtained on inland waters as well as on the coast. It has long been known to breed in Norfolk, and though there are some places, as at Scoulton, where it has ceased to do so, it still breeds freely on some Meres to the north of Thetford, and less abundantly in the Broad district. It has almost ceased to nest in the tract of marshes about Hickling. The Rev. W. Whitear in the diary before quoted says under date of 26th of May, 1818, "Taylor has found fifty-six eggs [of the Shoveller] this spring" in the Winterton marshes.

270. Pintail (*Dafila acuta*).

Hunt mentions having seen several Pintails for sale in Norwich market during June and July. In May, 1878, Mr. Booth saw a pair at Hickling, and as latterly only the male was seen, they may have had a nest ('Rough Notes,' part xiii.). As it is believed to have bred in Northumberland, there would be nothing remarkable in its having bred in Norfolk. It is chiefly known at the present

day as a winter visitant and rather a scarce one: five were sent to Norwich in January, 1879; but Mr. Stevenson's annual records contain few entries which refer to this species.—G.

271. Teal (*Querquedula crecca*).

The Teal, though generally distributed in the summer, does not breed in such numbers as might be expected. On our largest Broads it is less plentiful at that season than the Garganey. In autumn a considerable number of migrants come from the north, but probably much fewer than formerly, there being far less extent of marsh and water to attract them than was the case a century ago.

272. Garganey (*Querquedula circia*).

A summer visitant, probably on the increase. Sheppard and Whitear had no positive knowledge of its breeding in Norfolk, and Mr. Lubbock only appears to have been aware of the fact from seeing the young broods upon the water in July and August; both Lubbock and Paget quote Girdlestone as their authority for this species breeding in the Broads. Nests are far from uncommon now.—S.

273. Wigeon (*Mareca penelope*).

A common winter visitant, the Wigeon has been also occasionally noticed during the summer months on our inland waters. There is a late spring passage of Wigeon northwards, well known to gunners on the coast.

274. Red-crested Pochard (*Fuligula rufina*).

The credit of adding this Duck to the British list belongs to a Norfolk naturalist, Hunt (*cf.* Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 225), who figures a female shot on Breydon, strange to say in the month of July: he states that there was another Norfolk specimen in Bullock's celebrated collection in London.* Two were shot at Yarmouth in the winter of 1826, the same year which produced others in different parts of England (*cf.* Yarrell, 'British Birds' 1st edition, vol. iii. p. 230). Yarrell

* Professor Newton has favoured us with the following note with regard to this specimen: "The specimen in Bullock's Museum formed Lot 96 of his Sale Catalogue, 6th May, 1819, but the entry (p. 33) is there printed 'Round-crested Duck, killed in Norfolk; extremely rare.' My priced copy shows that it was bought for three guineas by Lord Temple."

says another was afterwards shot at Yarmouth, very likely the drake now in Mr. Borrer's collection at Cowfold in Sussex. In December, 1827, a drake was killed at Surlingham; in January, 1844, another, now in the Norwich Museum, was shot at Horsey; and in December, 1867, a female was shot at Hickling. There can be little doubt that a drake in perfect plumage, knocked down at Stephen Miller's sale in 1853 for £1 18s., was killed on Breydon: if this were so Norfolk has produced nine in all.—G.

275. Pochard (*Fuligula ferina*).

This species, which visits us in large numbers in the winter, has long been known to breed in Norfolk. Hunt states that he was informed in 1818 that it bred at Scoulton, and in 1836 Salmon, as appears from his diary, was informed by Mr. Carter that it bred annually in the same locality, whilst the late William Hewitt has told me that "years ago" he had shot many "Red head" Flappers there with the late Mr. Blofield. It has ceased to breed in that precise locality, but in the Meres not many miles distant from Scoulton they now nest annually in goodly numbers.—S.

276. Ferruginous Duck* (*Fuligula nyroca*).

The Ferruginous or Nyroca Duck has probably been obtained oftener in Norfolk than in any other county, yet there is no reason to suppose it has ever bred here. Over twenty occurrences are recorded.

277. Scaup (*Fuligula marila*).

A winter visitant to the coast, not common. Examples are occasionally though seldom killed on our inland waters.

278. Tufted Duck (*Fuligula cristata*).

Common as a winter visitant; this Duck was long suspected to breed in Norfolk, but the fact was not established until 1876. That it now does so rather abundantly in the south-west of the county is evident from the fact that we were able to count on the 26th of June, 1882, at least three distinct broods on one mere, and two on another, at Wretham. In May, 1885, I saw four nests at

* The hybrid between the Nyroca and Pochard, which has received the name of Paget's Pochard, has occurred in Norfolk three times, males of course, females being rarely detected among hybrids.

Stanford Mere, and counted thirty birds. In the Broad district on the east of the county there is only one record of its nesting, but in March, 1881, there were on Ranworth Broad a flock of about fifteen, presumably on passage. Formerly Ducks of all kinds were shot whenever seen, and although a pair or two doubtless bred annually in suitable localities, only those which escaped observation survived; but since the passing of the Bird Preservation Acts, the numbers of all the species breeding in this county have greatly increased.—G.

279. Golden Eye (*Clangula glaucion*).

Common as a winter visitant; but males in adult plumage are never seen before Christmas. It is not very likely that the Golden Eye ever bred here, although Lubbock suspected such was the case; but a few years ago a female was certainly sent to Norwich market in July ('Zoologist,' 1880, p. 404), and three instances are on record of their being seen in pairs well into May.

280. Buffle-headed Duck (*Clangula albeola*).

An adult male, the first killed in England, was shot at Yarmouth in 1830, and at the dispersal of the late Mr. Rising's collection, was purchased for the Norwich Museum. There are only two other authentic records of its occurrence in the British Isles.

281. Long-tailed Duck (*Harelda glacialis*).

Young birds are not uncommon, and some fine adults in winter plumage have been recorded from time to time by Mr. Stevenson. Sheppard and Whitear say that many were killed at Yarmouth in the winter of 1819–20, a portion of which were adult. The Rev. S. Micklethwaite has a Long-tailed Duck, shot on Hickling Broad, in full breeding plumage: another, equally good, was taken at Acle on June 14th, 1885. Their occurrence at that season is very noteworthy.

282. Eider Duck (*Somateria mollissima*).

This species occasionally appears on our coast in the winter time in small flocks, generally composed of female birds, as was the case in December, 1884, when several were shot. More rarely an adult male is obtained.

283. Steller's Duck (*Somateria stelleri*).

A magnificent male, though not quite adult, was shot at Caister—most likely on the Denes between that village and Yarmouth,—in February, 1830, and was presented in the following year to our Museum by the Rev. G. Steward, with a Kite, Little Owl, and several other birds. An example shot off the Yorkshire coast in 1845 is the only other British specimen on record.

284. Common Scoter (*Œdemia nigra*).

During the greater part of the year flocks of "Black Ducks," as they are commonly called, may be seen off any part of our coast. Some frequented Hickling Broad in the summer of 1875 (Stevenson, Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 210); but the winter is the time when they are oftenest seen, and then only at sea. "Immense numbers" were observed in February, 1870 (Stevenson, 'Zoologist,' 1870, p. 2362), off this coast. On a calm day they will often feed close in shore.

285. Velvet Scoter (*Œdemia fusca*).

The Velvet Scoter is sometimes seen at Cromer, but is not sufficiently common off Blakeney for the gunners to know it. Paget mentions several at Yarmouth in 1829–30. Mr. Stevenson, records an unusual number "off the coast" in November, 1870 ('Zoologist,' 1871, p. 2498), and two in January and February following (*l.c.* pp. 2600, 2603). Mr. Booth met with "flocks of Velvet Scoters and Long-tailed Ducks off Yarmouth" in February, 1882 ('Rough Notes,' pt. x.), implying that there were a good many of the former. In a general way it may be said to be a winter visitant of regular, but by no means frequent, occurrence.—G.

286. Goosander (*Mergus merganser*).

During the last few years this species, as a winter visitant, has been decidedly abundant, occurring for the most part on lakes, such as are not far from the sea being the most favoured; and single birds have frequently been killed on our rivers as far from the coast as Norwich, or further—Hellesdon and Drayton being parishes in which both this species and the Smew have been several times obtained.—G.

287. Red-breasted Merganser (*Mergus serrator*).

A winter visitant. The Merganser has been singularly rare of late, confirming what has been previously observed, viz., that when the Goosander is met with, this species is not.

288. Smew (*Mergus albellus*).

A winter visitant, which is once known to have been met with as late as the 25th of April (Stevenson, Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 548). Adult males are seldom or never obtained before Christmas: males in change have occurred, but are rare at any time. In January, 1871, the Smew was unusually abundant, owing, it was supposed, to the very severe weather; Mr. Stevenson recording no less than ten, of which seven were adult ('Zoologist,' 1871, p. 2600).

[11. Hooded Merganser (*Mergus cucullatus*).

Reasons, which it must be confessed are cogent, for doubting a Hooded Merganser said to have been killed at Yarmouth in 1829, are given by Professor Newton in our 'Transactions,' (vol. ii. p. 408). The only other claim we can advance, and that a slender one, is in behalf of J. D. Hoy's adult male, recorded by the late Edward Blyth, and believed to have been obtained in Norfolk at a date prior to 1838 ('Naturalist,' vol. iii. p. 413), considered by Bree to be still in the Hoy collection (*cf.* 'Field,' December 14th, 1867)].

In compiling the foregoing list we have been careful to exclude all species (with two exceptions) which may have been derived from imported stock, or which have not undoubtedly occurred in a state of nature on at least one occasion in the county of Norfolk. The exceptions referred to are the Red-legged Partridge and the Mute Swan; the former has become so thoroughly acclimatised, and is so widely distributed in this county that it may be considered as fully naturalised, and the same may be said with even greater force of the Mute Swan. This has necessitated the omission of the Canada and Egyptian Geese for the first reason, also of the Pine Grosbeak and Great White Heron, which were included in Mr. Stevenson's list of 1883 on what, it is now admitted, was

insufficient evidence; but we are enabled to add four other species which have recently been recorded, viz., the Icterine and Barred Warblers, the Serin Finch, and the Mediterranean Black-headed Gull. There are also eleven species, which, for various reasons, we have thought it best not to number consecutively in the present list, but which on the other hand we did not think it desirable altogether to omit: these are the Grey-capped Wagtail, Aquatic Warbler, Eastern Golden Plover, and Hooded Merganser, on the ground that the evidence of their having been killed in Norfolk is not perfectly satisfactory; Pallas's Grey Shrike, European Coal Titmouse, Scandinavian Rock Pipit, and Bridled Guillemot, which are not accepted by all Ornithologists as distinct species; and the Red-winged Starling, Green-backed Porphyrio, and Pelican, which it is possible may have escaped from confinement; all these species are placed in square brackets and numbered consecutively 1 to 11. There are also a few species named in foot notes which are not included in the text for reasons there specified.

The total number of species enumerated by Messrs. Gurney and Fisher in 1846 was 277; Mr. Stevenson in 1864, after eliminating two or three doubtful species, estimates the number at 293, and in his list contributed to White's Directory of Norfolk in 1883, after withdrawing eleven species from his previous list and adding eleven fresh ones, he leaves the total unaltered. If we have erred, it has been on the side of caution; but by the standard which we have adopted the total in 1887, notwithstanding the addition of four new species, has been reduced to 288; but if we add the eleven species distinguished by square brackets, the number is raised to the very respectable total of 299.

The county of Norfolk contains 2026 square miles, and from its geographical position—extensive sea board, and numerous streams and lakes bordered by broad tracts of marsh land—presents great attractions for shore and marsh-loving species, as well as for migrants in their autumn passage; and in birds of this latter class, Suffolk, Norfolk, Lincolnshire, and Yorkshire are exceptionally favoured. In our own county Breydon Water has produced more rarities than any like extent of country in the kingdom. Close cultivation, however, whilst it has undoubtedly increased the numbers of some species, has driven from us some of

those which were formerly the most typical. The following species which formerly nested in Norfolk have entirely ceased to do so, viz., the Spoonbill, Cormorant, Peregrine Falcon, Kite, Hen Harrier, Common Buzzard, Raven, Bustard, Avocet, Black-tailed Godwit, Grey Lag Goose, and Guillemot; whilst the Marsh and Montagu's Harriers, Hobby, Short-eared Owl, Oystercatcher, and Ruff, are all but extinct as breeders; the Bittern and Black Tern, under exceptional circumstances, and at rare intervals, probably, still in solitary instances, stay to nest. The Common and Lesser Terns, Ring Dotterell, Lapwings, and Redshanks are decreasing in numbers; but we have reason to believe that the Great-crested Grebe, Stone-curlew, and perhaps the Sheldrake, after having been reduced to a very low ebb, have of late years, rather increased in numbers than otherwise. We might perhaps add to these the Snipe, which, since the passing of the Bird Acts, nests with us in somewhat increased numbers; but this certainly does not apply to the autumn and winter migrations of this bird. The same may be said with regard to the Woodcock, and certainly in a marked degree of all the Wild Ducks which breed in Norfolk. It is worthy of remark that of the ten species of Ducks commonly known to breed in the British Isles, eight nest regularly in this county.

There is one bird now rapidly becoming scarce with us, owing to constant persecution, for which we would especially plead, we refer to the Barn Owl, than which the farmer and game-preserver does not possess a greater friend, and yet there is scarcely a game-keeper's gibbet on which it is not found, and very many are annually brought to the Norwich bird-stuffers. Mr. Frank Norgate counted twenty-six good-sized rats in the nest of a single Barn Owl, which were quite fresh, and as the weather was very hot at the time, he is convinced they must all have been killed the previous night: let those who know the destruction committed by rats when they have young ones, which is almost all the year round, try to realise the service performed by this pair of birds, and then judge of the wisdom of allowing them to be destroyed. Both the Long-eared and Brown Owls are scarcely less serviceable, and would increase rapidly if not so often killed when met with.

We do not purpose to institute a comparison between the Avifauna of Norfolk and those of the neighbouring counties of which lists have been published, as we are of opinion such a comparison would be unfair to this county. The Birds of Norfolk have over a very long period of years been closely studied, and the published lists subjected to a succession of severe revisions, constituting such an ordeal as no other county list has passed through, so much so that one would think the object of each author was to eliminate as many species as possible, rather than to add new ones. We believe the ornithology of no county in England has been so closely investigated as that of Norfolk; we are sure, therefore, that the authors of those excellent contributions to the faunas of some neighbouring counties will not think we undervalue their work, if we are of opinion that a like ordeal would somewhat reduce the number of species at present claimed by them.

It has been our endeavour, and not only ours, but, we doubt not, that of all our predecessors, carefully to examine the title of every species, new or old, before admitting it to a place in our county list, and we trust that the results of our labours will be found trustworthy.

We desire to express our great indebtedness to Mr. Stevenson both personally and through the published portion of his admirable 'Birds of Norfolk;' also to Professor Newton and Mr. J. H. Gurney, Sen., for their kind advice and assistance.

ADDENDA ET CORRIGENDA.

Page 268. No. 30. For "Gorleston," *read* "Bradwell."

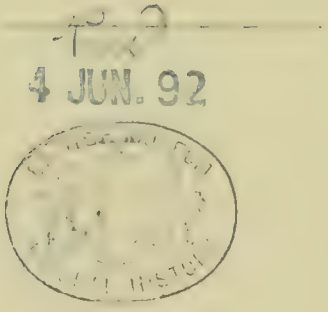
Page 271. No. 46. Sixth line, *omit* the words "though one was shot at Horsey." See 'Zoologist,' 1887, p. 70.

Page 274. After No. 70, *insert* "*70. NUTHATCH (*Sitta cæsia*). A common and generally distributed resident."

Page 276. No. [illegible]. GREY-CAPPED WAGTAIL (*M. cinereicapilla*). Whether or not this bird be entitled to specific distinction, an honour

denied in the 'Ibis' list to such examples as possess a white ear-streak, which is absent in the true *M. cinereicapilla* (*M. viridis* of Gmelin), it is interesting to find that there exists in Mr. Thomas Boynton's collection, in Yorkshire, an example precisely like the Norfolk one, which was obtained by him from Dr. W. W. Boulton, who purchased it from Pratt of Brighton, where it was shot in 1867. The true *M. cinereicapilla* is found in the northern portion of the Palæarctic Region, and it is probable that the individuals killed in Norfolk and Sussex had a northern origin. Our bird was shot on May 2nd (*cf.* 'Annals of Natural History,' 1842, p. 353).

Page 279. No. 102. SERIN FINCH (*Serinus hortulanus*). The slight amount of hesitation we had in including this southern species in our list has been removed by the capture of a male bird on the Yarmouth Denes on February 5th, 1887, particulars of which will be found, *ante* p. 392, furnished by Mr. Stevenson, who saw it in the flesh.



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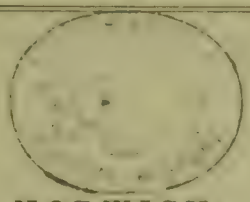

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IN TRAVELLING OUTFIT.

From a block kindly lent by the Proprietors of 'Good Words.'

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The Treasurer in Account with the Norfolk and Norwich Naturalists' Society, Year ending 27th March, 1888.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from last year	12	19	3	By Fletcher and Son, for Printing *Transactions*, 1886—87	36	15	0
,, Subscriptions:—				,, Goose & Co., for Printing	1	10	6
3 for 1885—86	0	15	0	,, Norfolk Chronicle Company, for ditto	1	5	6
12 ,, 1886—87	3	0	0	,, Jarrold & Sons, for ditto	0	13	9
188 ,, 1887—88	47	0	0	,, G. Quinton, Bookbinding	0	18	0
1 ,, 1887—88	0	10	0	,, Corrick & Baxter, Alteration of Bookcase	1	10	0
1 ,, 1888—89	0	5	0	,, Advertisements	0	5	0
	51	10	0	,, Insurance	0	3	0
,, Additional payments for monthly notices	0	19	0	,, Postage and Carriage	6	6	3
,, Sale of *Transactions*	4	12	0	,, Gratuity to Doorkeeper	0	10	0
,, Interest	0	13	7	,, Museum Subscription	2	2	0
				,, Assistant Secretary's Salary	5	0	0
				,, Balance at Messrs. Gurney's	13	14	10
	£70	13	10		£70	13	10

LIFE MEMBERSHIP FUND.

	£	s.	d.				
To Balance from last year	66	16	5				
,, 6 Compositions for Membership	18	0	0				
,, Interest	1	12	6	By Balance in Post Office Savings Bank	£86	8	11
	£86	8	11				

Norwich, 27th March, 1888.

Examined and found correct,
STEPHEN WM. UTTING, *Auditor.*

List of the Publications received by the Society as Donations or Exchanges from March, 1887, to March, 1888.

BATH Natural History and Antiquarian Field Club. Proceedings, vol. vi. no. 2. 1887. *From the Club*

BELGIUM. Annales de la Société Royale Malacologique de Belgique. Tome 21. Année 1886. Royal 8vo. *From the Society*

——— Annales de la Société Belge de Microscope. Tome XI. Année 1884—85. 8vo. *From the Society*

BENNETT (Arthur, F.L.S.) Arabis Alpina L. in Scotland. Also, Juncus Tenuis, Willd., in Scotland. [Reprinted from the Scottish Naturalist.] pp. 3. 8vo. *From the Author*

BERWICKSHIRE Naturalists' Club. Proceedings, vol. xi. no. 2. 1887. *From the Club*

BRISTOL Naturalists' Society. Proceedings, New Series, vol. v. part 2. 1886—87. *From the Society*

CALIFORNIA Academy of Sciences. Bulletins nos. 6 and 7. 8vo. San Francisco, 1887. *From the Academy*

CARDIFF Naturalists' Society. Report and Transactions, vol. xviii. 1886. *From the Society*

——— Transactions, vol. xix. part 1. 1887. *From the Society*

——— The Flora of Cardiff, by John Storrie. 8vo. Cardiff, 1886. *From the Society*

CROYDON Microscopical and Natural History Club. Proceedings and Transactions, March 10th, 1886, to January 2nd, 1887. 8vo. Croydon, 1887. *From the Club*

CUMBERLAND and Westmoreland Association for the Advancement of Literature and Science. Transactions, nos. 11 and 12. 1885—87. *From the Association*

DUMFRIESSHIRE and Galloway Natural History and Antiquarian Society. The Transactions and Journal of Proceedings. Sessions 1883—86. 8vo. *From Mr. A. Bennett, F.L.S.*

EASTBOURNE Natural History Society. Transactions, New Series, vol. i. part 11. and vol. ii. part 1. 1886—87. *From the Society*

EDINBURGH. Botanical Society. Transactions and Proceedings, vol. xvi. part 3 and vol. xvii. part 1. 1886—87. 8vo. *From the Society*

——— Geological Society. Transactions, vol. v. part 3. 1887. *From the Society*

Edinburgh. Royal Physical Society. Proceedings, vol. ix. part 2. 1886—87. *From the Society*

Essex. The Essex Naturalist: being the Journal of the Essex Field Club. Vol. i. nos. 3—12, and vol. ii. nos. 1—3. 8vo. *From the Club*

Feilden (Lieut.-Col. H.W., F.G.S.). Notes on Stone Implements from South Africa. [Reprinted from the Journal of the Anthropological Institute, November, 1883.] pp. 13. 8vo. *From the Author*

Grieve (Symington). Opening Address. [From the Transactions of the Edinburgh Field Naturalists' and Microscopical Society.] pp. 11. 8vo. *From Mr. A. Bennett, F.L.S.*

——— Notes on some new and rare British Plants. [From the Transactions of the Edinburgh Field Naturalists' and Microscopical Society.] pp. 2. 8vo. *From Mr. A. Bennett, F.L.S.*

Groves (Henry & James). Notes on the British Characeæ for 1883 and 1885. [Reprinted from the Journal of Botany for January, 1884, and January, 1886.] 8vo. *From Mr. A. Bennett, F.L.S.*

Glasgow Natural History Society. Proceedings, New Series, vol. i. part 3. 1885—86. *From the Society*

Hertfordshire Natural History Society and Field Club. Transactions, vol. iv. parts 5—7. 1887. *From the Society*

Ibis (The), a Quarterly Journal of Ornithology. Edited by Philip Lutley Sclater, M.A., Ph.D., F.R.S., and Howard Saunders, F.L.S., F.Z.S. Fifth Series, vols. 2—5. 8vo. London 1884—87. *From Mr. G. F. Buxton, F.Z.S.*

——— ditto. Fifth Series, no 21. January, 1888. *From Mr. G. F. Buxton, F.Z.S.*

Ibbotson (Henry). The Ferns of York, including also Nidderdale and the districts around Thirsk, Scarbro' and Whitby. pp. 24. 8vo. York, 1884. *From Mr. A. Bennett, F.L.S.*

London. Geological Society. Quarterly Journal. Nos. 168—171 Nov., 1886—August, 1887. *From Lieut.-Col. Feilden, F.G.S.*

——— Royal Geographical Society. Proceedings, April, 1887, to March, 1888. *From Mr. H. G. Barclay, F.R.G.S.*

——— Royal Microscopical Society. Journal. Second Series, April, 1887—February, 1888. *From the Society*

——— Quekett Microscopical Club. Journal, Second Series, vol. iii. nos. 18, 19 and 20. May to December, 1887. *From the Club*

——— Royal Institution of Great Britain. Proceedings. Vol. xi. part 3, and vol. xii. part 1. 1887. 8vo. *From the Institution*

London. Linnean Society. Journal. Zoology. Nos. 114, 116—118, 126—129, 136. 1886—87. 8vo.
From Mr. J. H. Gurney, jun., F.Z.S.

——— ——— Journal. Botany. Nos. 146—149, 152—154. 158—161. 1886—87. 8vo.
From Mr. J. H. Gurney, jun., F.Z.S.

New Zealand Institute. Transactions and Proceedings; edited by James Hector, C.M.G., M.D. F.R.S. Vol. xix. Royal 8vo. Wellington, 1887. *From the New Zealand Institute*

Northamptonshire Natural History Society and Field Club. Journal, nos. 28 and 29. 1886—87. *From the Society*

Northumberland. Natural History Transactions of Northumberland, Durham, and Newcastle-upon-Tyne. Vol. ix. part 1. 1887. 8vo. *From the Society*

Norway. The Norwegian North Atlantic Expedition, 1876—1878. [In Norwegian and English.] Parts 15, 17, and 18. Folio. Christiania, 1886—87. *From Professor Newton, F.R.S.*

Contents:—

No. 15. Zoology. Crustacea, part ii. By G. O. Sars. 1886.

No. 17. Zoology. Alcyonida. By D. C. Danielssen. With 23 plates and 1 map. 1887.

No. 18 in 2 parts. The North Ocean, its depths, temperature, and circulation. By H. Mohn. With 48 plates and maps. 1887.

Palæontographical Society's Publications.
From Lieut.-Col. Feilden, F.G.S.

Contents:—

A Monograph of the Eocene Mollusca; by Searles V. Wood, F.G.S. Bivalves, parts 1—3 and supplement. 1861—1877.

A Monograph of the Eocene Cephalopoda and Univalves; by the late Frederic E. Edwards, F.G.S., continued by Searles V. Wood, F.G.S. 1877.

Paris. Feuille des Jeunes Naturalistes. Nos. 198—209. Avril, 1887—Mars, 1888. *From the Society*

Plymouth Institution and Devon and Cornwall Natural History Society. Annual Report and Transactions. Vol. ix. part 3. 1886—87. *From the Plymouth Institution*

Ranzani (Abate Camillo). Elementi di Zoologia. Four vols. 4to. Bologna, 1819—23. *From Professor Newton, F.R.S.*

Rickard (John C.). Notes on four series of Palæolithic, and on some Neolithic Implements from South Africa. [Extract from the Cambridge Camden Society Communications, vol. 5, pp. 57—74.] 8vo. *From Lieut.-Col. Feilden, F.G.S.*

Rogers (Rev. W. Moyle, F.L.S.). On the Flora of the Upper Tamar and neighbouring districts. [Reprinted from the Journal of Botany for 1883.] pp. 16. 8vo. *From Mr. A. Bennett, F.L.S.*

Russia. Bulletin de la Société Impériale des Naturalistes de Moscou. Année, 1886, nos. 3, 4. Année, 1887, nos. 1—4. Année 1888, no. 1. *From the Society*

Seebohm (Henry). A Visit to the Valley of the Yenisei. [Read before the Royal Geographical Society, January 14th, 1878.] pp. 16. 8vo. Lond. 1879. *From Lieut.-Col. Feilden, F.G.S.*

Staffordshire (North) Naturalists' Field Club and Archæological Society. Annual Report and Transactions. 1887. 8vo. *From the Society*

Stockport Society of Naturalists. Third Annual Report; with List of Members, Rules, &c. 1887. 8vo. *From the Society*

Suffolk Institute of Archæology and Natural History. Proceedings, vol. vi. part 3. 1888. 8vo. *From Mr. J. H. Gurney, jun., F.Z.S.*

United States of America. Annual Report of the Smithsonian Institution for the year 1884. In two parts, 1885, part i. 8vo. Washington, 1885—86. *From the Smithsonian Institution*

——— Sixth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1884—85; by J. W. Powell, Director. Royal 8vo. Washington, 1885. *From the United States Geological Survey Office*

——— War Department. Signal Service Notes. No. 23. 8vo. *From Lieut.-Col. Feilden, F.G.S.*

Contents:—

No. 23. Cold Waves and their Progress, by Thomas M. Woodruff. 1885.

——— American Museum of Natural History. Bulletin, vol. ii. no. 1, 1887; and Annual Report for the year 1886—87. 8vo. *From the American Museum*

Victoria. Geological Survey of Victoria. Prodromus of the Palæontology of Victoria; or, Figures and descriptions of Victorian Organic Remains. By Frederick McCoy. Decades ii.—vii. 1875—82. Roy. 8vo. *From Mr. R. G. Goggs*

Zoologist (The). A Monthly Journal of Natural History. Edited by J. E. Harting, F.L.S. Third Series. vols. 8—11. 8vo. Lond. 1884—87. *From Mr. G. F. Buxton, F.Z.S.*

——— Third Series, vol. 12, January to March, 1888. *From Mr. G. F. Buxton, F.Z.S.*

I.

NOTES ON SOME ANCIENT CUSTOMS AND REGULATIONS WITH REGARD TO THE FRESH-WATER FISHERIES OF THE COUNTY OF NORFOLK.

By T. Southwell, F.Z.S.

Read 26th April, 1887.

The second half of the present century has been remarkable for the revival of interest in the long-neglected fish and fisheries of our inland waters. For a long previous period the value of our fresh-water fisheries as a source of food and recreation appears to have been utterly disregarded. Salmon and Trout were more or less cared for, but with these exceptions no precaution whatever was considered necessary to prevent the extermination of the less valuable species. Of late, however, this has all been changed, and I am happy to be able to record that our own county of Norfolk has taken a foremost part in this most desirable revival. I use the word revival advisedly, for it will be the object of this paper to show that our more remote ancestors were wiser in their generation than our immediate predecessors, and that they attached considerable value to the supply of fresh-water fish, and took infinite pains to insure their due preservation, and to enforce judicious regulations with regard to their capture.

Thirty years ago the extensive inland waters of this county, which are estimated at five thousand acres of "broad" and two hundred miles of river, comprising shallow water and deep, still water and stream (the whole forming certainly one of the most perfect natural nurseries, for what are called "coarse fish," to be found in England), were utterly neglected and given over to the

poacher. Fish were taken at all times, and by every conceivable method, many of the modes employed being terribly destructive, until the waters were so depleted as to alarm the lovers of the angle, for which the banks of the Yare have always been so celebrated. The result was that a society called the "Norwich and Norfolk Anglers' Society" was established at Norwich in the year 1857, having for its object the protection of the fish inhabiting the waters so dear to Norwich anglers, by putting in force some of the ancient powers vested in the Corporation of Norwich, to which reference will be made further on. This society laboured incessantly to restrict the wholesale and unsportsmanlike destruction of fish which prevailed so extensively; but at first, owing, amongst other causes, to the limited jurisdiction of the City Corporation, with very little success. Nothing daunted, however, their efforts were continued until this at first humbly constituted body so increased in numbers and influence, as eventually to succeed in obtaining a special Act of Parliament known as the "Norfolk and Suffolk Fisheries Act, 1877;" and the counties of Norfolk and Suffolk enjoyed, and do still enjoy, the proud distinction of having an Act of Parliament all to themselves. Under this Act a body of conservators was appointed, who framed a code of efficient bye-laws, which are enforced by the anglers' society now known as the "Yare Preservation and Anglers' Society," the due observance of which has been attended with the most beneficial results.*

But this excellent society did not rest satisfied with having done its best to protect for the benefit of the many the bounteous supplies of fish which were unfairly swept away by the few. Under its auspices the "National Fisheries Exhibition" was held at Norwich in 1881; the first of a series which culminated in the Great International Fisheries Exhibition, held in London in 1883. The movement originated in this obscure corner of the kingdom may therefore be said to have lead to results of even national importance. From these exhibitions great things

* I regret to find in some quarters a tendency to undervalue the privilege thus obtained at a cost of so much labour and expense, and a desire to relinquish our exceptional legislation in favour of a more general Act providing a close-time for rod fishing, a precaution which, however beneficial it may prove in waters of limited extent, is certainly not necessary in the abundantly watered district to which our Act applies.

were expected, and doubtless we all learned very much that was previously unknown to us with regard to fish and fish people; but in one respect they all signally failed—the lasting effect on the literature of the subject seems to have been almost *nil*. Large sums of money were voted in prizes for essays on fish and fishing, which it was hoped, and we were led to believe, would be made accessible to all, and prove of great permanent value. But alas! the Norwich essays were never published, or even seen, save by the jury whose business it was to adjudge the awards; and those of the Great International Exhibition, in a complete form, were issued (doubtless for some good and sufficient, but much to be regretted, reason) at a price which was quite prohibitory to a poor man; and so sparingly were they distributed to our public institutions (if at all), that, so far as the writer is aware, there is not a single copy of the International Prize Essays in any public library in the important fishing county of Norfolk, nor has he ever had access to one. When we contrast this result with the enlightened liberality of the United States Commissioner of Fisheries, by whom all who take an intelligent interest in such matters are kept well informed with regard to the fishing and kindred industries of the New World, the comparison is not much to our advantage, and we cannot but regret that the Royal Commissioners did not make special provision for the distribution of the essays which were adjudged worthy of prizes in, at least, the great fishing centres of the United Kingdom.

The interest which is being awakened in the fresh-water fisheries of Great Britain, and which I have tried to show our own county has not been backward in promoting, is most excellent in itself, and let us hope that it may lead to increasingly good results. But we must not arrogate to ourselves wisdom superior to our predecessors in what we are too accustomed to regard as the dark ages; for we shall see that in days long ago the products of the fresh waters of, at least, this county of Norfolk, were quite as highly esteemed, and as carefully guarded, as at present; and that it was only our immediate ancestors who allowed the fish to be destroyed without check, and the courses of the streams to be impeded by mills, and fouled by sewage and other impurities.

The many Acts of Parliament (some passed as early as Henry IV., but more especially in the enlightened reign of Queen Elizabeth)

for the regulation of the fresh-water fisheries, show the importance which was attached to the subject in those early times; and as might be expected in a county so abundantly supplied with inland waters, and so thickly studded with religious houses, the inmates of which looked to their stew-ponds as the main source of food supply at certain seasons, the gifts of Providence thus lavishly bestowed upon them were highly valued, and carefully guarded. Many were the disputes arising out of infringements of rights of fishery, some of which assumed a rather lawless character,—as for instance, when in 1413 Clement Paston trespassed on the ponds belonging to the Abbot of St. Bennets, and took from thence two hundred roach, two hundred perch, and three hundred eels, which were together valued at the high price of one hundred shillings, and other similar instances might be quoted. Perhaps mere secular fish would not have been quite so costly as the Lord Abbot's; but we shall have to refer to the high-handed actions of the powerful family of the Pastons on another occasion.

Commencing with the City of Norwich, whose jurisdiction on the river Yare is of very ancient date, we find, by a charter dated 4th of Edward IV. (1461), that the corporation possesses extensive powers which are jealously guarded even to the present day. "We have granted," says the charter, "to the same citizens, and their successors for us and our heirs, that the same mayor and sheriffs at all future times for ever, have search in the river of Wensum [now called the Yare below Trowse Eye] by all the length of the same river, that is to say, from a certain place on the north part of the City of Norwich, called the Sheep Wash, unto the cross called Hardele Cross, near Bredyng, to survey, and search all the nets, wears, and other engines for taking fish being found in the same water, and to take, carry away, retain, and at their pleasure burn all and singular the things, which, as well by examination as by inquisition shall happen to be found, placed, or erected there against the form of any statutes passed, or to be passed, or to the destruction of young fish called Fry, in punishment of those who shall have so placed, erected, or henceforth presume to place or erect such nets, wears, or engines there, and to sentence, and amerce, or put to fine, all and singular, those so placing the same nets, wears, or engines there, according to the laws, ordinances, and customs of the city aforesaid, passed and to

be passed, or so to inflict other penalties according to the ordinances aforesaid." This charter was supplemented by an Act of Parliament of 33 George II., c. 27, by which it is made the subject of a fine of twenty shillings, or in default imprisonment with hard labour for a term not exceeding three months, for any person to take, have in his possession, sell, or expose for sale, "any spawn, fry, or brood of fish, or any unsizeable fish, or fish out of season, or any smelt not five inches long," etc., and these two acts constituted the authorities under which the Corporation took action till the year 1877, when the Yare Preservation Society obtained an act entitled the "Norfolk and Suffolk Fisheries Act 1877," under which a joint board of conservators for Norfolk and Suffolk was appointed, and a code of bye-laws drawn up and sanctioned by the Home Secretary, which are vigorously enforced mainly by the beneficial action of the above-named society through their watchers.

From time immemorial it has been the practice for certain members of the Corporation, accompanied by the town clerk, to take boat from Norwich and proceed annually, in the month of August, to Hardley Cross—an ancient stone cross situated about fifteen miles from Norwich, at the junction of a tributary of the Yare called the Chet, and marking the boundary of the jurisdiction of the city—and at the foot of the cross to read a proclamation in the following words:—

"Oyez! Oyez! Oyez! If there be any manner of person that will absume, purfy, implead, or present any action, suit, plaint, or plea, for any offence, trespass, or misdemeanor done or committed upon the Queen's Majesty's River of Wenson, let him repair unto the Right Worshipful Mr. Mayor and the Worshipful Sheriff of the City of Norwich for the redress thereof and he shall be heard. God save the Queen."

Having thus asserted the jurisdiction of the city authorities, the party return on board their boat, which is usually a commodious steam yacht, and it is needless to say much festivity follows. The words "absume" and "purfy" have caused considerable speculation as to what they may mean; and in order to put the matter to the test, a former town clerk was asked what he would do supposing some person should appear before the mayor and express himself desirous to "absume" or "purfy." The town clerk was, however, quite equal to the occasion, and replied that he should request him

"to do it forthwith." From Hardley Cross to the sea, the jurisdiction of the Yare is in the hands of the Yarmouth authorities.

A further proof of the jealousy with which the common people regarded the privilege of free fishing, both fresh-water and marine, is afforded by the petition presented to Edward VI. (1549) by the leaders of Kett's rebellion, in which occur the following clauses :—

> "We pray that Ryvers may be ffre and comon to all men for ffysshyng and passage."
>
> "We pray that the pore mariners or ffysshermen may have the hole profightes of ther ffysshynges, as purpres, grampes, whalles, or eny gret ffysshe, so it be not preiudiciall to your grace" ('Norfolk Garland,' p. 117).

The following regulations for the fresh-water fisheries on the Yare are copied from the 'Norwich Assembly Book' under date of "St. Matthew the Apostle 3 and 4 Philip and Mary" (1556) :—

> "Regulations made for the Fresh-water Fishermen between the tower at Conisforthe and Hardley Cross.
>
> "No one to bete in the night time for Perches or any other fish.
>
> "No person shall use any 'Lambe nett' or wycker baskett . . . for destroying of small fishes.
>
> "No person or persons shall have above vij Trammells wyde and narrowe and tenne Bowenetts.
>
> "No person shall 'bushe' more than two days in the week viz. upon the Monday and Thursday.
>
> "No person shall lay any bokes or boke.
>
> "No casting net be occupied between Ship washe and Hardley Cross.
>
> "No man shall 'trolle' in the river.
>
> "No person shall 'jobbe' in the river.
>
> "Item that every man shall be bound to keep a dog to hunt the otter and to make a general hunt twice or thrice in the year or more at time or times convenient upon pain to forfeit ten shillings.
>
> "No fisherman being a common fisher or victualler to market shal at any time fish with Flewe sett nette or any other engyne within the city bounds from the Chain to the New Mills.
>
> "No fisherman shall put any long netts into the river to take fish there in spawning time, that is to say three weeks before Chrowchmas [3 May] and three weeks after Chrowchmas."

It is worthy of observation what excellent regulations for the proper conservation of the fresh-water fishes the above rules are.

Night fishing is disallowed, unduly destructive engines, as well as the "destroying of small fishes," are prohibited, and a close-time during the spawning season enacted. The regulation with regard to Otter hunting is a very interesting one, and doubtless would be considered no hardship. Probably at that time Otters would be very numerous and destructive to the fish; even in the present day these animals are far from uncommon in some parts of this county, notwithstanding the ceaseless war waged against them.

The river Yare, with a fall of only four inches to the mile, is utterly unsuited for Salmon, and it is doubtful whether these fish ever to any extent visited its sluggish waters, but that they were occasionally taken below the mills there is plenty of evidence. In the Le Strange Household Book, on the 21st December, about the year 1530, a reward of eightpence is entered as given to the "felaw that brought a Samon from Lambard, the miller at Swanton Mills." Sir Thomas Browne, in 1663, says that "among the fishes of our Norwich river, we scarce reckon Salmon, yet some are yearly taken," and an order in the Norwich 'Court of Mayoralty' Book, dated 2nd November, 1667, would certainly not have been made were there no Salmon to be fished for. The order is as follows:— "It is ordered that the bellman give notice that if any person shall take any Salmons from the Nativity of our Lady unto St. Martin's day or destroy any young Salmons by netts or other ingens from the midst of April until the Nativity of St. John Baptist shall be punished according to law." Occasionally an unseasonable fish strays up the Yare, and is captured by accident, but in the present day we can certainly "scarce reckon" them among the fishes of our Norwich river; and my only reason for mentioning them was to show that even two hundred years ago the authorities were careful to guard them against unfair fishing.

Spenser has immortalised one little Norfolk fresh-water fish by mentioning it in the 'Faërie Queene' (book iv. canto xi. verses 33 and 34). He says in the "Marriage of the Thames and Medway:"—

> "Next cometh Yar, soft washing Norwich walls,
> And with him bringeth to their festival
> Fish, whose like none else can show
> The which men *Ruffins* call."

The Ruff, to which Spenser refers, was first described by Dr. Caius under the name of *Aspredo* in 1570, and is spoken of by Sir Thomas Browne as *Aspredo perca minor*, so it has a history ancient enough to entitle it to mention in these antiquarian notes. There is a very ancient Smelt fishery still carried on in a most picturesque way by torch-light, from boats moored in the very centre of the city, but I know of no very early special mention of it.

Below Hardley Cross we pass into the jurisdiction of the Yarmouth Corporation, which extends from the sea up through the tidal lake known as Breydon Water to Hardley Cross, on the Yare; on the Waveney, as high as St. Olave's Bridge; and on the Bure, to Weybridge. These rivers, and the adjacent "broads," all abound with fish of various kinds, chiefly Pike, Perch, Roach, Bream, Tench, and Eels. But it is only necessary here to refer to the Eel fishery, which is an industry with a very ancient history. Along the courses of the rivers just named are a number of fishing stations for Eels, the present number of which I do not accurately know, but at the time of which I am about to speak they numbered thirty-six. These stations, for some reason, are still, and have been time out of mind, known as "Eel-sets," and are thus constructed:— A net is stretched quite across the river, fastened by ropes to stakes on either bank, the bottom being kept down by means of lead sinkers, and the upper line supported by cork floats. As the streams are navigable, the net has to be sunk to the bottom on the approach of a wherry. This is done by means of three lines attached to the top line, and led through blocks fixed to stakes at the bottom of the water, to the eel-setter's hut on the shore. By hauling on these lines the net is sunk to the bottom, and the craft passes over without stopping or injuring the net, after which it is raised to the surface again. In this long wall of net are three or four openings, to which purse nets about eighteen feet long, stretched on hoops like bow-nets, are attached, the far end being closed. These "pods," as they are called, are extended down stream, and fastened to stakes in the river bottom, their positions being marked by floats. The eel-sets are worked at night, during the autumn months, and when the fish are running to the sea, therefore, of course, only whilst the water is ebbing. Very often the eel-setter occupies a hut erected on an

old boat pulled up into a side dyke, and there he spends the night, listening for passing craft, in order to be at hand to lower his nets for their passage. Towards morning he raises his nets, and, if fortunate, may be rewarded by twenty, thirty, or even more, stone of Eels. Fabulous catches are on record; but, as his outfit will cost something like thirty pounds, and the labour is considerable, he generally earns all he gets. In the day-time the "pods" may be seen stretched out on the shore to dry, and, not unfrequently, the fisherman also, seated at work making good any wear and tear or damage they may have received.

Manship, in a manuscript history of Great Yarmouth written in 1619, and published with continuations in 1854 by the late C. J. Palmer of Great Yarmouth, gives a list of these eel-sets and a great deal of curious information about them; but a still more particular account of the customs connected with them will be found in Swinden's History of Great Yarmouth (1772), from which what follows is condensed. On the "sixte day of Maye the XVIII yeare of our reigne, 1576," Queen Elizabeth writes to "our trustie and welbeloved the bailiffes, burgeses and comynaltie of our towne, burghe, and libertie of Greate Yarmouth in the Countye of Norfolke," asking that "certen fishinge groundes and places called *settes*, to the number of XXXV named and specified in a schedule herein inclosed" which had been let "time out of mynde" to very small profit, might be leased for a term of thirty years to one John Everest, "one of the ordynarye yeoman of our chamber," and at that time the water bailiff of Yarmouth. This the town agreed to do, but failing, on account apparently of the ill health of the town clerk, to execute the lease before the time came round for the renewal of the licenses annually granted to the tenants of the eel-sets, the Pastons, a powerful family having large possessions along the river, declared that the corporation of Yarmouth had forfeited their rights over the river, and instigated the men to take possession of the eel-sets as usual. The Yarmouth authorities therefore lodged a "complaint," in which they recited the facts of the case from their own point of view, explaining the customs which had hitherto prevailed of the bailiffs of that town granting the right of fishing in the following terms:—"In which said ryvers, there be used two kyndes of fishinge; the oune for flote fyshes, and alwayes hathe bynne used in common for all fyshermen there

aboutes: and the other fyshing of eles wyth settes, and grounde nettes, hath bene of long tyme used in this kind of severaltie" namely, the bailiffs for the time being upon the Monday next after the feast of "St. Barnabie the Bright," granted these eel-sets from year to year to the fishermen for one penny each set. Through the illness of the town clerk as before said, neither was the lease to Everest executed, nor were the licenses renewed, hence the plea of Clement and William Paston on behalf of the fishermen that the right to lease was forfeited, to the consternation of the townspeople, who on the plea of poverty, begged that they might be allowed to carry out their arrangement with Everest, and that the Pastons be cited "to answer concerning their said dealings." In the Pastons' reply, some further particulars of the customs pertaining to the eel-sets are revealed. It appears that the eel-sets were held from the owners of the soil on either bank of the river free, except that they yielded to them a "reasonable composycion of eles, as customablie hathe bene used" for the privilege of staking their poles and drying their nets on the river banks; their custom with regard to claiming the fishing stations being as follows:—"Yerlie in the daye of St. Margaret, every fysherman, that could that daye, after the rysinge, firste come to anye of the said ele settes in anye of the said ryvers, and there stayed, and pytche a bowghe at the said ele-sett the same fysherman should have and enjoye the same ele-sett that year," subject only to the complimentary contribution to the owner of the soil before mentioned. This custom of "who coulde first come and set his bowghe in and upon any of the said settes" the Pastons affirm, the setts being few and the fishermen many, led to contentions, and that under this pretense and that of insuring a more equitable distribution of the good and bad setts, the bailiffs of Yarmouth some thirty years before had applied to the Quarter Sessions of the County for power to regulate the fisheries by assigning to the fishermen each one his particular set, which was registered in his name for the time being, the charge of one penny being made for the same. The Pastons further urge that in course of time the bailiffs of Yarmouth seeing the profit which could be made out of the letting of the fisheries, began to charge for the best eel-sets "such greate rewardes" that the fishermen began to withdraw from presenting themselves to the bailiffs at all, and reverted to their old customs, which the bailiffs discovering, and

fearing to lose their profit, "practised" with their water bailiff to obtain the Queen's letters for the grant of the lease of the fisheries for thirty years at an annual rental of thirty pounds as before explained. Therefore the Pastons beg, in the interest of the poor fishermen, that this arrangement of the bailiffs of Yarmouth may not be allowed to be carried into effect. Finally, after hearing the whole matter in chancery, a commission dated 8th June, 1577, sat at North Walsham, and made a decree in favour of the bailiffs of Yarmouth.

When speaking of the Norwich Corporation rights on the river Yare, I mentioned the annual pilgrimage to Hardley Cross for the purpose of reading a proclamation setting forth their claim of jurisdiction. A similar custom also prevailed at Yarmouth, and appears in Manship's time (he died in 1625) to have been a very extensive affair. He states that he had often taken part in the procession, which he thus describes:—"And to the end that good order may be, in and by the same water liberties, the better preserved, the Bailiffs for the time being, two several days in the year, with many of their ancient bretheren and others of the society, the Inquest of the Liberties, Musicians, and other officers, on them attending—with banners and ensigns displayed, sometimes with sound of trumpets, beating of drums, playing of fifes, and otherwhiles sweetly singing,—do pass on these waters, carrying scales, or 62 brass measures with them, to try if the nets of the fishermen be lawful; when if they be not, they be punished according to the quality of the offence committed. Both Bailiffs taking their course together the first day, till at Norwich water-mouth they take leave of each other; the senior Bailiff to St. Olave's, the junior to Hardley Cross, where either of them after O! Yes! thrice" reads the proclamation (which we need not quote) and then returns to Yarmouth, each Bailiff taking his party with him, "where if any cheer, in their boats, upon the waters, was wanting at dinner, the same at their houses, be largely supplied at supper." The next day both the bailiffs together go to Weybridge, where like proceedings take place. Swinden, writing in 1772, thus refers to the discontinuance of this rather riotous mode of asserting their jurisdiction:—"This public parade of going up the rivers at last, becoming so expensive (the number of boats &c. amounting sometimes to 130 or 140) and attended sometimes

with fatal accidents, was in the year 1748 discontinued, and has not since been revived; the inquest of the liberties going up with a few select friends only, in a private manner, and the custom of collecting the pence of the fishermen for many years past disused; and the rivers now common and free for any fisherman in a lawful manner." Even this modified ceremony of proclaiming the Corporation rights has, I believe, been abandoned since the year 1835.

We now come to the ancient town of King's Lynn, situated on the river Ouse at its entrance to the Wash, and we find that here also in times long since no less care was bestowed in order to regulate their fisheries on what must be considered the most enlightened principle. The regulations distinctly refer to the "Haven and River of the said Town;" and although doubtless many salt-water fish were taken there, they were only such as enter the estuaries of tidal rivers. Mackerell ('History and Antiquities of Kings Lynn' 1738) quotes from a "genuine Roll of parchment, curiously adorned with Blue and Gold Figures and Letters: At the End or Bottom of the Roll, on a Blue Ground in Letters of Gold is inscribed, Vivat Regina Elizabetha," and states that the roll was then, and probably still is, "among the Lynn evidences." Statutes dating from the 1st, 4th, and 12th of Henry IV. (1399—1411), Henry VI., Henry VIII, and Elizabeth are referred to. The general orders for "the keeping and preserving the Haven of Lynn and the Fish thereof" state that under "Privileges, Liberties, and Grants given and made from sundry princes of this Realm by Charters, under the great seal of England," the local authorities had the power of keeping and preserving the haven and river and "ordering and correcting the Fishermen" as to the killing of fishes there, and the oversight of their "nets and engines," and orders that "six certain persons were to be regularly chosen to inspect the same," six others were to see that "all annoyances by throwing or casting [into the river] any Horse-muck, Sedge, Rushes, Straw, Bushes, Rubbish, Gravel, or any other Coulder whatsoever" should be avoided, and the Mayor was empowered to appoint four other persons out of the company of the Fishermen of the said town who shall be charged on their Oaths diligently to look to the observing and keeping all ordinances which do especially concern the company of Fishermen, under a penalty of thirteen shillings and fourpence should they refuse to act.

Then follow "Special orders to be observed by the Fishermen of the town of Lynn, as well for their orderly Fishing in and upon the said River, as also for the Preservation of the young Fry of Fish there, and for other meet and convenient Usages, to be kept and observed of the said Fishermen in their said Trade and Dealing."

The first section contains regulations for berthing the boats, prohibits fishing with a "Trimmer" between St. German's Bridge and the Cross Beacon between Holy Thursday and the First of August, prohibits the use of "any Swinge of a Net, but that a Threepence may go through," between May Day and the Fifteenth of August; orders that so soon as any man "hath hooked his Net, he shall throw the Brood or Fry in again," and states the minimum size of the fish allowed to be retained. Penalties are "ordained" for any person wilfully fouling his neighbour's lines, selling bait to strangers, for setting "a Lift on his Swing End of two inches and a half width, and two yards long, between St. Faith and St. Andrew;" bringing "any Prock into the Fleet, except it shall be Sticklings;" or if "any man shall go a handing, and be found with any Brood or Prock, both shall forfeit every time eight shillings."

The second section provides for the preservation of Spawn and Fry, and it is ordered that enquiry be made whether any person do take, "either with Net or any other Engine, any young Salmons, from the middle of April to St. John Baptist;" to enquire if any Wears are erected "at such straitness as the young Fry of Fish be thereby destroyed;" "whether any do hang across the said Haven any Nets or Engines call'd *Trunks*, or any other sort of Nets fastened or hanged continually Day and Night;" whether any person, "with any Nets, Devices, or Engines, do take and kill any young Brood, Spawn, or Fry of Fish . . . contrary to the Statute made in the first year of Q. Elizabeth." Then follow orders as to prohibiting the taking of unseasonable Salmon, Trout, etc., or any "Pyke or Pickerell" not being 10 or more inches long, Salmon 16 inches, Trout 8 inches, or Barbel 12 inches, and fixing the mesh of the nets used at $2\frac{1}{2}$ inches; "provided nevertheless, that for the Taking and Killing of *Smelts*, *Lochies*, *Minims*, *Bull-heads*, *Gudgeons*, or Eels, it shall be lawful to use such Nets, and other Engines, Devices, Ways, or Means, as

heretofore hath been used; but not to take and kill Spawn or Fry of Fish, under the Penalty of the Statute."

Then follow equally wise regulations for the Oyster fishery; and thirdly, some very conservative regulations with regard to supplying the home market, by which it is ordered that fish are not to be forestalled by strangers, and carried away to other places, before the fisherman has "brought his fish home into Dowse Street," on pain of forfeiting five shillings for each "time of doing otherwise," but they must be first offered in the said town for the town's provision.

I think it may be fairly said that the bye-laws just quoted show a degree of enlightenment for which we have, perhaps, hardly given our forefathers credit, and that these wise enactments must have fallen sadly into disuse in after times. At present, the *Stow-net* is freely used in the harbour at Lynn, ostensibly for taking bait, but with terribly destructive effect to fry of all kinds, more especially to Smelts; and the same fish is taken by draw-nets higher up the river, on its spawning grounds, literally by the ton. As the latter practice is not resorted to in the navigable waters over which the Norfolk and Suffolk Fisheries Conservators have power, it is beyond the reach of the law, but is not the less destructive.

My primary object in unearthing these old fishery customs and laws from the dusty tomes in which they are hidden away was the desire to remove, if possible, an impression that such matters were neglected by our ancestors, but I trust that, even independently of this, they may not be without interest, and perhaps some instruction, to the fishermen of the present day.

II.

NOTES ON THE ISLES OF SCILLY AND THE MANX SHEARWATER (*PUFFINUS ANGLORUM*).

By J. H. Gurney, Jun., F.L.S.

Read 25th October, 1887.

The interesting paper in our Transactions by Mr. Edward Bidwell on the Birds of Scilly incites me, as a brother ornithologist, to transcribe the notes, or some portion of them, made during a very pleasant week, extending from May 10th to 16th, 1887, a period far too short to do more than taste the loveliness of these enchanting islands. The celebrated gardens at Tresco Abbey, on which the late Mr. Smith lavished so much money and care, were just then in all their spring beauty, with their wealth of Palms, Dracænas, Mesembryanthemums in profusion, flowering Arums, and green hedges of Escallonia, dotted with its flowers of red, dividing the Potato fields; in fact, much blossoms then, which is lost to those who only visit the islands in their July loveliness. Unfortunately, the Eucalyptus, which is the largest tree on the islands,* is dying, and many of the Ilexes and Pinasters are terribly injured in their tops by the salt spray and wind. The Sycamore seems to stand these enemies best, but has not been very extensively planted at present. The late Lord Proprietor left money for keeping up the gardens, and, under the watchful eye of the present owner and his gardener, Mr. G. D. Vallance, there is no fear of their deteriorating.†

Birds come in for a large share of the Lord Proprietor's attention, and the "List" alluded to by Mr. Bidwell is shown at the Abbey to any one interested. Some of the rarities, however, in this List, which is in manuscript (and has been drawn up by Mr. F. J. Jenkinson), were *seen*, not shot. The Rufous and Great

* And also the largest but one in Europe, Mr. Bidwell informs me

† Photographs of them can be obtained of Gibson, at Penzance.

Reed Warblers alluded to therein (Bidwell, Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 204) were *seen* by a former keeper, David Smith. Mr. Jenkinson states that the former frequented a reed-bed below the Abbey road for about a fortnight, at the end of September, 1883. Smith, I was told, had a very good knowledge of birds, but, as it was not obtained, its identity can hardly be considered as proved.

Mr. Dorrien Smith has begun a collection of Scillonian Birds to which, since Mr. Bidwell's visit, has been added White's Thrush, (*Turdus varius*, Pall), shot by his butler, Mr. G. Britton, on December 2nd, 1886. This is the eighteenth British specimen. It frequented the Abbey garden for three weeks; November is therefore the month which should be accredited with it, and not December. Ten of the eighteen British specimens have been killed in January, and of two the date is not known. There is an undoubted tendency among birds of the eastern Palæarctic regions, when they do come here, to visit us about mid-winter. Its general haunt was, Mr. Britton informed us, the Long walk, among the Dracænas,—just the place which this ground-feeding Thrush would choose; in fact, from their habits in this respect, they have been more than once mistaken for Woodcocks.

The latest published List of the Birds of the Scillies is that by the Rev. R. W. J. Smart, contained in the Transactions of the Penzance Natural History Society for 1885—86; in which, besides his own observations, are incorporated those of Mr. A. Pechell, Messrs. J. H. and F. Jenkinson, and Mr. F. R. Rodd. It is not a lengthy article, and, did space allow, I should like to have made some remarks upon it, but fear, lest my pen should occupy more than its share of our Transactions. The Rufous and Great Reed Warbler are not included, and only two occurrences of the Grey-headed Wagtail, of which we saw a fine male, are given. It is doubtful if the Chough has ever been seen, and no Jay has ever visited Scilly, which is odd, as they are such well-known North Sea migrants, and occasionally occur on the island of Heligoland in great numbers.*

Strange to say, none of the old writers on the Scilly Islands, from Botoner (1478) to Borlase (1758—59), have anything to say about the Manx Shearwater (*Puffinus anglorum*, Tem.), and it is

* I saw a plumassier's shop there full of Jays' wings.

not certain that they even once allude to it. Willughby, who visited the Land's End with Ray, in 1662, heard that it was found on Scilly, a statement repeated by Pennant and Selby; but it was not until Mitchell's well-known narrative of the colony on Annet appeared in the first edition of Yarrell's 'British Birds,' that anything definite was known. This reticence was probably due to its peculiar habits. Botoner, after mentioning St. Mary's, says: "*Insula Rascow* [? Tresco] *pertinet abbati Tavystock, continet in longitudine* 3 *miliaria, et in latitudine* 3 *miliaria, inculta, cum cuniculis et avibus vocatis popliyns.*"* The reference here is, probably, to the true Puffin, though it may be to the Shearwater; but, apparently, the word "Puffin" is not in use among the natives now for either species. Botoner was no naturalist, and his references to birds are very scanty; in one place (p. 154), apparently referring to an island of the Scilly group, he couples Cormorants with Cats and Mice! †

Perhaps the most interesting bird at Scilly is the Manx Shearwater, and strange to say, of the forty islands which bear herbage, it inhabits only one—the island of Annet. Annet is said to be the only island where there are no Rats, which abound on most of them. Possibly the odour of the Shearwaters is distasteful, for they could certainly swim across from St. Agnes.‡ There had been a terrible robbery on Annet, a few days before our visit, of Shearwaters or their eggs, or both, and the south end of the island was dug over in all directions. Notwithstanding this, we had no difficulty in finding the objects of our search; indeed the ground was so honeycombed, that it was impossible in some places to avoid stepping on, and breaking into, their domiciles.

Mr. H. A. Macpherson, in a remarkably interesting paper, has fully discussed the question to what degree Shearwaters are nocturnal in the breeding season (Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 215), and I will only say that we observed one

* Itinerarium Willelmi Botoner, p. 98.

† Many early notices of Cornish birds are quoted or referred to in Mr. Harting's Introduction to the 'Birds of Cornwall.'

‡ The Rev. M. A. Mathew says there is a strong colony of Shearwaters on Skomer Island, Pembrokeshire, and no Rats. But the happy conjunction does not seem to have been noticed elsewhere. It is said, though it is unlikely to be true, that they were extirpated by Rats in Man.

issue *voluntarily* from its hole in the daytime, and that when leaving by steamer, we saw, a few miles to the northward of the Scillies, several small flocks, and a gathering of seventy or eighty, at about 10.30 a.m. Yet a person might sit down among their burrows upon the island of Annet and not know of their existence. Their plan of only leaving and entering these burrows after dark is a provision of nature for greater security, their eggs being so much easier to obtain than the Razorbill's, or the Guillemot's, hence these wise birds are careful not to draw attention to them by coming out of their holes in the daytime. It would take very little to extirpate a colony of Shearwaters such as that on Annet, and if they had not fortunately as warm a friend and guardian in the present Lord Proprietor as in the last, their days would soon be numbered. The recent robbery had been committed by some Tresco men, and Mr. Dorrien Smith speedily had the culprits found out and brought up before him. Alas! there appeared to be a fatality on the poor Shearwaters in 1887, for before they had time to recover, a wreck took place by the Bishop Rock, and sad havoc was made of the island of Annet by five hundred head of cattle, which were saved from the ship, and landed there. They trampled everything to pieces, broke in all the Shearwaters' holes, probably destroying many birds, and made a ruin of everything (J. H. J. and E. D. S. *in litt.*).*

The Scillonian name for the Manx Shearwater is "Crew;" while a Puffin is called a "Pope."† There is so much similarity between the words, that we cannot but think the "Creyser" of Richard Carew to be the Shearwater ('Survey of Cornwall' [1602] p. 35), all the more so that at various breeding stations it has had names bestowed upon it beginning with the letter C, indicative of

* On the 31st of March, 1871, there were ninety-nine Manx Shearwaters in Leadenhall Market, which showed by their clean plumage, and dislocated necks, that they had been caught in their burrows. Two of the salesmen said they came from Cornwall; and, I suspect, though it was contradicted in the 'Field,' that they had been stolen from Annet. I could not learn that they are ever eaten by the inhabitants of the Scilly Islands, either fresh or salted.

† Harting gives a list of Cornish names of Birds from the vocabularies of Borlase, Pryce, and Polwhele (*l.c.* p. 312), as well as a list of provincial names now, or formerly, in use (p. 314).

its note. Carew puts it between "Murres" and "Curlewes," and reckons it among the "Citizens of the Ayre" which "serve for food to us." In the same list he distinguishes the Puffyn, and says it "hatcheth in holes of the clyffe."

On misty nights the "Crews" get the more bewildered of the two, and Mr. Vingoe says that one flew with such force against St. Agnes lighthouse as to break the glass. Adjoining St. Agnes is an island called Gugh, and this, if the wind be from the west, is in the line of flight of the Shearwaters. Captain White informed us that thirty-six had been picked up there in a day, and on proceeding to the spot we found twenty, besides the remains of five more. Some had broken necks, and most of them exhibited the marks of a violent blow, as if they had been dashed against the rocks.* No doubt this was the case, and probably the previous Monday night, May 9th, had been a fatal one to some of them, as it was very misty; and a serious collision between two vessels took place off the Land's End.

Our boatmen were of opinion that at Annet the Shearwaters made their own holes, and not Rabbits.† It would really require a series of section diagrams to give a true idea of the twists and turns which some of the holes take; but the accompanying woodcut shows two of the simplest drawn from memory, and these

* Bishop Stanley mentions two Shearwaters colliding with such force as to kill one another ('History of Birds,' p. 82), and one of them is in the Norwich Museum, to which it was presented by the late Bishop. See also Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 221.

† Professor Newton says Shearwaters make their own holes in St. Kilda (A. N. *in litt.*).

were burrows made by the Shearwaters I have no doubt. I think the egg is generally at the end of the burrow, and certainly the ceiling of the chamber in which it is deposited is sometimes not more than six inches from the surface. When taken out, the Shearwater makes no attempt to escape.

It is most likely, from Mr. Bidwell's observations, that they rake the hole out with the beak (*l.c.* p. 213); but I was so careful about not further disturbing them after the recent robbery, that my observations on their nesting arrangements were incomplete. At the southern end of Annet the rocks are overlaid with a thick bed of soil, partly peat, partly sand, which their hooked beaks, aided probably by their feet, easily make an impression upon. Debes says they use both ('Færoa Reserata,' p. 145), and his account, which Mr. Bidwell quotes, though printed more than two hundred years ago, is very faithful. This situation is quite unlike the place where they nidificate at Eigg, on the coast of Scotland, where Mr. Macpherson says they nest on cliffs from one to seven hundred feet in height (*l.c.* p. 216).*

Mr. Mitchell alludes to the Shearwaters' habit of occasionally congregating (Yarrell, 'British Birds,' vol. iii. p. 570). In August, 1885, Captain White, of St. Mary's, saw a flock, mostly birds of the year, reaching *two miles* on the water, and comprising, he believes, *many thousands*. They appeared to be very tired or all asleep, and were so tame, when he ran his boat among them, as to allow themselves to be touched with a boathook. It is not likely that so many had been bred on Annet: they had probably just arrived from further north, perhaps from Scomer Island in Wales. The colony at Annet, at a rough guess, may number two hundred pairs, which would not have been near sufficient to provide such a congregation; moreover, their tendency would be to move south as autumn approached.

I have devoted so much space to the Shearwater that I must pass briefly over the other species. The Shag (*Phalacrocorax graculus*) is very common, and on Great Inisvouls we found about twelve nests with eggs, and one with young birds, which, on May 12th, was early. One youngster was blind, and the other two just able to see. Only two of the nests had three

* I have been favoured with a sketch of the exact place by Mr. Arthur Macpherson, which in every way agrees with his cousin's description.

eggs. The young ones were very noisy, which attracted our attention as soon as we landed. Their large seaweed nests were all out of sight, hidden away in the clefts of the rocks, but this was, I imagine, not so much for concealment as for protection from wind.

No Cormorants nest on Inisvouls, and, as far as our experience went, they are much less common on the Scillies than the Shag. Mr. Smart says "the Cormorant is the earliest sea-bird of all in commencing breeding," and that he had taken eggs "slightly incubated on March 14th" (*l.c.* p. 76); perhaps, therefore, they are earlier than the Shag. On May 30th Mr. Bidwell found young of both nearly ready to fly (*l.c.* pp. 206, 207), and by the same date those I found would have been quite as forward. The Cormorant is a greedy destroyer of fish: Shakespeare speaks of the

"Insatiate Cormorant,"

and Chaucer of

"The hote Cormorant full of gluttonie."

Yet, for all that, one is sorry to hear that Mr. Smart thought it necessary, in the interests of the fishermen, to shoot so many.

We found a fairly good supply of other sea-birds' nests, but there was too much wind to visit the outer islands, and it was disheartening to see over one hundred Gulls' nests robbed on Menewethan, where Mr. Bidwell had found them breeding in peace. The Gulls eat the corn (of which there is none too much on the islands), as testified by their ejected pellets, a practice which will bring them into disfavour. I saw it some time ago stated in the 'Field' that Gulls never eat corn, but that they do so in Scilly is an undoubted fact, and in the Orkney Islands too, as I can bear witness from the infallible test of dissection.

Puffins, or "Johnny Popes," as they are called, are very abundant on Scilly. Guillemots, on the other hand, are comparatively rare. My brother-in law and I found several Oystercatchers' nests, and were surprised to see how high up on the rocks they were. It is said that in Lancashire they sometimes lay four eggs; but we did not find more than three. The Turnstone is extremely common, but never nests here. The Curlew is common, and nowhere are there tamer Purple Sandpipers than on the isles of the

"Cassaterides." Mr. Smart does not seem to have recognised the abundance of the Purple Sandpiper (*l.c.* p. 171), which we found very common, but no doubt in different seasons their numbers vary, as is the case with so many birds everywhere. We saw two Great Northern Divers in, apparently, complete breeding plumage: they seem to linger on the coast of Cornwall, for I remember, many summers ago, assisting in the chase of a pair in Falmouth harbour, and one of them, which succumbed to the aim of Mr. Howard Fox, was as perfect a bird as it was possible to have.

After leaving the islands, an hour was spent very pleasantly at Penzance with the veteran naturalist Mr. Vingoe, now over eighty years of age, who showed us the Yellowshank and American Solitary Sandpiper,—both shot by his son, of which he is, naturally, very proud,—the American Little Stint, Red-breasted Flycatcher,* Cream-coloured Courser, etc. He also produced a lovely Grey Phalarope *in breeding plumage*, adult, and far redder than any British specimen I ever saw, which from the circumstance of its having only one leg, is evidently the one shot at Par, recorded by the late Mr. Rodd ('Zoologist,' 1878, p. 255). As hardly any of Mr. Vingoe's rarities are labelled with date and locality, it is exceedingly probable that when he is gone the value of many of them, as local specimens, will perish with him. Indeed he has *already forgotten* the dates of most, although he can give the circumstances connected with their capture. I advised him to write what little he knew on the stands of all before it was too late, knowing that the identity of many a rare British bird has been irrecoverably lost, at the death of its owner, for want of this necessary precaution.

* I bought this Flycatcher, but on returning home, found it was unrecorded. Mr. Vingoe states that he received it from Scilly in the same parcel with Mr. Rodd's, both in the flesh. That would be in October, 1863. But Mr. Rodd's not having recorded it, if he knew about it, as Mr. Vingoe says was the case, is very unaccountable; and I am bound to add that a gentleman, who is the best authority on the birds of the Scilly Islands, suspects some mistake in the matter.

III.

ADDITIONAL NOTES ON THE MANX SHEARWATER.

By Rev. H. A. Macpherson, M.A.

Read 27th March, 1888.

I understand from Mr. E. Bidwell, that Mr. J. H. Gurney, Jun., proposes to *close* our joint account of the nesting habits of the Manx Shearwater. I am therefore anxious to supplement my former paper with a few brief observations.

(1) I have no doubt that the Eigg colony *is* decreasing, owing to human agency. When visiting the precipitous cliffs at Cleardale on July 15th, 1886, I ascertained that most of the nests that could be reached without a rope had already been robbed. The islanders not *only* take the eggs, but they often kill the nesting birds as well. A search of several hours only yielded a single young Shearwater, and that in such an emaciated condition that it died in my hand a few minutes after being extricated from its nest. Clearly the old birds had been killed, and the young one perished of hunger. The specimen was placed in spirits, that its anatomy might be described by my friend Professor Parker.

(2) I wish to point out that while a young chick, obtained in 1885, was covered on the belly with grey down, encircled with a zone of white, the chick of 1886 had the entire under-surface pure white. This last consequently agreed with the late Mr. Mitchell's Cornish specimens of young (Saunders' Yarrell, vol. iv. p. 24).*

(3) I should like to repeat here the view which I expressed to Mr. Howard Saunders some two years ago, that the Malaga bird

*A nestling from Orkney, marked August 5th, is covered with greyish down, with a broad but faint white stripe along the centre of the throat, breast, and belly.—J. H. G., Jun.

from which he described (in the fourth edition of Yarrell) the supposed first plumage of *Puffinus anglorum*, belongs to some other, and perhaps undescribed, species.

Mr. Dresser states in the 'Birds of Europe' (vol. viii. p. 518) that the young Manx Shearwater in first plumage "*resembles* the adult, but is rather browner in tinge, and the crism and flanks are washed with brown." Now this description agrees with my specimens of young in first plumage from Eigg and Skomer. The two first I have lately given to the National Museum and to Mr. Howard Saunders, but the three exactly agreed, all being white-breasted. But the Malaga bird has the abdomen "*brown*," and the "throat and breast are mottled with brownish grey."

Mr. Hart, of Christchurch, has a (British-killed) brown-breasted Shearwater; and the Rev. A. Murray Mathew wrote to me that on one occasion he shot several of these brown-breasted birds in English waters. It is clear, at any rate, that the young of the race of *Puffinus anglorum* that nests in the British Isles are white-breasted. I believe *Puffinus anglorum* to be rather larger than the dusky or brown-breasted bird.*

(4) Although the late Mr. Robert Gray believed that the Manx Shearwater had numerous breeding stations on the Hebridean coast, he admitted to me that he could only name five stations as recently occupied, including Rum, Eigg, and the St. Kilda group.

I believe, myself, that the Manx Shearwater's gregarious habits are calculated to lead us to exaggerate its numbers. Tourists may see several hundred birds within an area of four or five miles, but they may with far greater ease steam a whole day and see no Shearwaters at all.

I think, however, that we shall find smaller colonies than those alluded to, on the west coast of Skye and elsewhere.

In 1886 a few pairs (perhaps half a dozen) of the Eigg Shearwaters excavated burrows in the sea cliff immediately above the beach near Cleardale, and close to the sea. I received three eggs

* The late Mr. Gatcombe gave my father one of these brown-breasted Shearwaters, shot at Bigbury in Devonshire in the autumn of 1875. It is a large bird, its measurements somewhat exceeding a normal Manx Shearwater. Its breast is quite a sooty colour, almost as dark as the back. Another received from Mr. Gatcombe is similar, but not so dark.—J. H. G., Jun.

from this colony from the lad who had discovered it. Nor should it be forgotten, that though the Shearwater prefers to tunnel a burrow of its own in a sandy or peat soil, yet it *can* accommodate itself, at a pinch, to a cairn among the rocks, nesting, of course, in either case in the dark.*

IV.

ORNITHOLOGICAL NOTES FROM THE NEIGHBOURHOOD OF YARMOUTH.

By W. Pycraft.

Read 27th November, 1887.

White-tailed Eagle (*Haliœetus albicilla*).

A bird seen flying over the North Denes in March, 1885, was believed to be of this species.

Osprey (*Pandion haliœetus*).

An adult male was taken in a trap at Somerleyton on May 8th, 1884, and on May 20th a young male was caught, but I was unable to learn the precise locality.

Barn Owl (*Aluco flammeus*).

In June, 1884, I took a half-grown Rat that had been recently swallowed from the stomach of a nestling, and from an adult female, shot at Thrigby, October 8th, 1887, I took five Mice.

* According to Saunders' Yarrell (vol. iv. p. 21) the Manx Shearwater was abundant on the Calf of Man "until a comparatively recent date." But in a letter written to the late Mr. T. C. Heysham, dated Jardine Hall, 24th February, 1836, by Sir W. Jardine, the following passage occurs:—"I had almost forgot the Isle of Man. It is nearly nine years since I was there. We went, as you observe, to seek the Manx Petrel, but were unsuccessful. The people said that it had certainly left the Calf several years previously, and if any numbers had been there we should not have missed them."—*Heysham MSS.*

From internal evidence, Jardine's visit seems to have been paid in 1827.

Short-eared Owl (*Asio accipitrinus*).

From one I skinned on October 21st, 1887, I took several common Dorbeetles (*Geotrapes vernalis*), the stomach being quite filled with them.

Red-backed Shrike (*Lanius collurio*).

In November, 1883, a male was shot at Somerleyton (8th), and another at Oulton (12th).

Pied Flycatcher (*Muscicapa atricapilla*).

An immature male was shot at Caistor on May 6th, 1885.

Black-bellied Dipper (*Cinclus melanogaster*).

The 'Yarmouth Independent Press' contains the record of one killed at Thurgeston in the first week of November, 1885.

Red-spotted Bluethroat (*Ruticilla suecica*).

An immature male was shot, September 14th, 1883, on the river Bure; and one was caught in a greenhouse in St. Nicholas' Road on September 15th, 1884.

Black Redstart (*Ruticilla titys*).

A specimen, sex unknown, was killed at Somerton on November 9th, 1887.

Sedge Warbler (*Acrocephalus schœnobœnus*).

A male was brought to me that had been taken on the Britannia Pier on August 11th, 1886.

Rock Pipit (*Anthus obscurus*).

Fifty of these birds have been netted on the Denes this season by a birdcatcher.

Lapland Bunting (*Plectrophanes lapponicus*).

Two were caught on the North Denes in October, 1884.

Sand Martin (*Cotile riparia*).

A cream-coloured variety was shot on the North Denes on September 29th, 1886.

Alpine Swift (*Cypselus melba*).

I saw one of these rare birds on September 13th, 1887, about seven p.m., with a quantity of Swifts (*C. apus*). It was hawking round Mr. Press's flour mill, the back of which adjoins Breydon

marshes. It had been noticed by several people during the afternoon, its superior size and white breast rendering it a very conspicuous object.

ROLLER (*Coracias garrulus*).

The late Colonel Probert killed an immature male at Bradwell during the first week in October, 1883.

HOOPOE (*Upupa epops*).

An adult male was shot at Herringfleet on September 12th, 1884, and I have records of one at Caistor, October 25th, 1884, and another at Kirkley in September, 1887.

RING DOVE (*Columba palumbus*).

I saw a bird of this species which had been in confinement nineteen years. It died November 28th, 1883.

PHEASANT (*Phasianus colchicus*).

A variety was obtained in which the tail was ocellated similar to that of a Peacock, without the brilliant colouring, and with dark zigzag marks along the edges of the middle tail-feathers.

LAND RAIL (*Crex pratensis*).

On May 28th, 1886, a Land Rail was picked up in an exhausted condition in the grounds of Mr. E. H. H. Coombe, at Gorleston.

SPOTTED CRAKE (*Porzana maruetta*).

Specimens obtained in October or November in 1884, 1885, and 1886.

MOOR HEN (*Gallinula chloropus*).

One was caught at sea, twenty miles off Cromer, and brought to me alive on December 28th, 1886. It lived until June of the present year. When dissecting it, I found the *os furculum* had been broken, and this accounted for its inability to fly. Its wings were quite perfect.

LITTLE BUSTARD (*Otis tetrax*).

One was shot near Yarmouth in November, 1885.

STONE CURLEW (*Œdicnemus scolopax*).

An adult male was brought to me November 5th, 1886. It had been shot at Winterton.

Dotterel (*Eudromius morinellus*).

An immature specimen was shot on the North Beach, September, 1883.

Kentish Plover (*Ægialitis cantiana*).

Several were obtained in the spring of 1885. On May 25th, 1887, a female was shot at Breydon, and two others seen.

Grey Plover (*Squatarola helvetica*).

Very numerous at Breydon in the autumn of this year (1887).

Avocet (*Recurvirostra avocetta*).

Five specimens of this bird were shot out of a flock of six at Breydon, May 4th, 1887.

Red-necked Phalarope (*Phalaropus hyperboreus*).

On September 27th, this year (1887), an adult female was shot on Breydon Water.

Woodcock (*Scolopax rusticola*).

In 1884 two females were shot (Belton, March 17th, and Somerleyton, April 2nd). Both had eggs in a forward condition.

Jack Snipe (*Gallinago gallinula*).

Fairly numerous this autumn (1887). Mr. E. H. H. Coombe shot five and a half couple at Belton in the second week of October.

Little Stint (*Tringa minuta*).

Has been quite plentiful on Breydon and the Beach this year (1887).

Curlew Sandpiper (*Tringa subarquata*).

Several have been obtained at Breydon during the autumn.

Redshank (*Totanus calidris*).

In July, 1887, I have two notes of this bird perching. One on a bough of a tree overhanging Filby Broad, and another I watched for nearly two minutes as it stood on a gate-post on Breydon marshes.

Bar-tailed Godwit (*Limosa lapponica*).

On May 31st, 1884, I skinned a specimen in full winter dress.

Curlew (*Numenius arquata*).

Large flocks seen on Breydon on August 15th, 1887. These autumn birds are known as "old harvest Curlews."

Little Gull (*Larus minutus*).

An adult specimen was killed on the North Denes, October 17th, 1887.

Glaucous Gull (*Larus glaucus*).

From the stomach of an immature example, obtained about thirty miles off Cromer (October 11th, 1886), I took the feathers, wing-bones, and part of the skull of a small bird, apparently a Lark.

Great Skua (*Stercorarius catarrhactes*).

One was shot at Breydon in September, 1887. I believe there are few, if any, other instances of its occurrence on this water before.

Manx Shearwater (*Puffinus anglorum*).

An adult male was shot on Breydon Water by Mr. Sharman on September 4th, 1883.

Purple Heron (*Ardea purpurea*).

One was shot at Oulton Broad, October 20th, 1886.

Bewick's Swan (*Cygnus bewickii*).

Two specimens were shot at Hickling, January 21st, 1887. One of them is now in my possession.

Sheldrake (*Tadorna cornuta*).

From the œsophagi of three young birds shot at Horsey Fen in 1884 I took a large quantity of fish spawn.

Ferruginous Duck (*Fuligula nyroca*).

In the first week of January, 1887, a specimen was shot at Potter Heigham. It was a male.

V.

VISIT TO A COLONY OF BLACK-WINGED STILTS' NESTS.

By J. Young, F.Z.S.

Read 27th November, 1887.

On the 7th June, 1883, I found myself bumping along in a native waggon, devoid of springs, and judging from the angles at which it sometimes travelled, quite independent of the laws of gravitation. It was drawn by a pair of miserable horses, covered with running sores. The thermometer stood above 90° in the shade before starting at 8 a.m., but shade there was none on the road, or rather track. The way lay across a level plain, stretching as far as the eye could reach, unrelieved by a single tree. The want of trees, however, was compensated to a certain extent by the profusion of the brightest flowers with which the ground was covered. One of the most conspicuous amongst the brilliant hues which met the eye was that of the lovely *Salvia nutans* forming large sheets of rich dark blue. There was an endless variety of Vetches too, ranging from pale lavender to dark purple, and from light pink to deep crimson. Wild Southernwood was also abundant, and loaded the air with its agreeable fragrance as it was crushed by the wheels of the waggon. Scores of Bee-eaters (*Merops apiaster*) were performing a variety of elegant evolutions on every side, apparently catching flies, or more probably Dragon-flies, with which the air swarmed. Now and again a White Stork or an Eagle would lazily cross our track, whilst a pair of Marsh Harriers might be seen beating the distant reed-beds. At the end of about three hours, a lake, separated from the Black Sea by a narrow ridge of sand, was reached, and I was not sorry when the time came to dismount. As I did so, the anxiety of a pair of

Ruddy Sheldrakes (*Tadorna casarca*) drew my attention to their downy brood, scrambling into the water, about fifty yards off.

After proceeding a short distance, I came upon a colony of Black-winged Stilts' nests. They were dotted about the mud some few feet from the water's edge, and were composed of reeds, and were raised some three or four inches above the mud, like diminutive Flamingoes' nests. It would be interesting to know whether this elevation represents the utmost rise in the level of the lake which was likely to occur. The full complement of eggs was four. The old birds flew round with quivering wings, uttering a shrill pee-pee-pee.

Dr. Cullen, writing from the same locality, described the nests as made in hollows in the mud. There is, I think, no doubt that he described the nest of the Avocet, which also affects the borders of the same lake, and, no doubt, breeds there, although I did not come across a nest; yet the two species were flying about, making an awful row together.

VI.

NOTES UPON THE NATURAL HISTORY OF ARRAN MORE AND "THE ROSSES," COUNTY DONEGAL.

By H. M. Wallis, Reading.

(Communicated by Edward Bidwell.)

Read 31*st January*, 1888.

The following observations were made during a fortnight's visit to the district during May, June, 1886. The author is aware that whatever interest they possess is due to the remoteness of the district, and the circumstance that it is seldom visited by naturalists.

The Rosses are the sea-board parishes of south-western Donegal, lying between the mountains and the Atlantic, bordered by a chain

of small rocky islands; the whole being almost destitute of timber, although the peat-bogs are full of the stools of Scotch Firs, etc., on one of which I saw marks of the axe. This wholesale destruction of covert has probably affected the character of the natural history of the district. Game is scarce. There are Badgers in the mountains, and Otters on the lakes. The latter trample the undergrowth on the little rocky lake-islets into regular tracks. Seals abound. One sees them daily, and at close quarters. Some are so large that I think they must be the Gray Seal.

I am no botanist, and only mention one or two uncommon plants which forced themselves upon my notice. The Royal Fern (*Osmunda regalis*) in almost incredible profusion, so abundant indeed that its thousands of springing heads gave a deep orange tinge to the pastures: *Viola lutea* in great profusion upon the sandy pastures of Rutland Island: and *Saxifraga cæspitosa*, in one place, half-way down the western cliffs of Arran More: also the Buckbean.

The geology of the whole district seemed so interesting that I was constantly longing for the presence and counsel of an expert in igneous formations. Granite predominates on the mainland, traversed by fissures which are filled with limestone. The island of Arran More seems a mass of gneiss, much resembling in the arrangement of its broad ribbon-like layers of white quartz, pink felspar and greenstone, the gneiss of Sutherlandshire. The bold coloration of these magnificent cliffs is a constant surprise. Some conspicuous headlands are as regularly banded as an agate—an agate as bulky as Cologne cathedral. This gneiss is extremely hard, and is traversed at the sea-level by innumerable caves, the haunt and breeding-place of Seals and Rock Doves. Some of these caves are inconspicuous at the mouth, but open out inside into lofty domes and galleries, the last usually terminating in a shingle beach. Most of these caves are formed at the lower end of an eruption of some dull, black, crystalline intrusive rock (qy. basalt), which traverses the gneiss in vertical dykes about six or eight feet in thickness. At the summit of the cliff, some of these dykes have weathered away, allowing the passage of a stream. A little detached island off the coast, which presents a circle of precipices to the sea, rising out of deep water, is interesting as an example of gneiss traversed by granite veins.

The rich red granite breaks out and divides, and sub-divides, and re-unites, here and there enclosing blocks of gneiss which its up-rush has apparently torn off. This fine example of a not very common natural phenomenon fortunately occurs at a point at which the cliff is accessible, and can be traced and followed up foot by foot.

The summit of Arran More is, I think, a form of quartzite cropping out through a deposit of Drift which, being denuded at the edges of the cliffs, reveals thousands of travelled boulders, the waste of the inland mountain peaks, consisting of every variety of granite, quartzite, and greenstone. These boulders are rounded, and water or ice worn, and lie unconformably upon the edges of the exposed quartzite and gneiss. Peat overlies all, both upon the mainland and Arran. This is being exhausted in places; the bare, bleached, granite *roches moutonnées* are exposed over districts which were peat-bogs within living memory. The soil is miserably poor and thin.

The Great Black-backed Gull is represented by perhaps half a dozen pairs nesting upon almost inaccessible skerries westward of Arran More. The Lesser Black-backed and Herring Gulls are common.

No Kittiwakes were seen until May 28th. They were apparently not nesting in the neighbourhood.

The lighthouse keeper upon Arran More, who is a fair taxidermist, and interested in birds, showed me a Pomarine Skua killed there late in May. No birds seem to strike this light.

Shags abound and breed. Cormorants are uncommon. They formerly tenanted one stack now used by the Great Black-backs, but were burned out during the nesting season by the fishermen, acting upon the advice of a local prophet.

A few Guillemots and Razorbills were seen along the cliffs of Arran, but they have no great breeding station upon the island. A single Puffin, picked up dead upon Rutland Island, was the sole representative of the species noticed.

The Black Guillemot is common, nesting in separate pairs all along the coast. A pair of eggs, much incubated, was taken on June 1st. On the previous day a nest, which was visited, contained well-fledged young; and a pair of fresh eggs was brought me on or about the same date.

On May 22nd a young Great Northern Diver was seen in the

Sound of Arran, and a second on May 28th. These birds were described by the fishermen as "balling" (collecting in large numbers) inside the island, previous to going north for the summer. I was unable to verify this.

Hearing that a bird, described as a "Herring Hawk," nested beside a mountain tarn inland, I visited the place mentioned on June 4th, and found a pair of Red-throated Divers breeding. The eggs were laid upon a quaking bog, among a patch of flowering Buckbean, about eighteen inches from the water's edge. Both birds were swimming near. I subsequently ascertained that, at least, two pairs had eggs in this district during June 1886.*

Red-breasted Mergansers were seen almost daily at low tide among the rocks inside the islands; but it was not until June 5th that I found that they had nested upon an island in an inland lake, from which fresh eggs were brought me. On visiting the nest next morning both birds left it.

Common Gull and Common Tern were nesting upon islands in the same lake, upon one of which I found a duck's nest, from which eggs had recently been taken, which I suspect was a Wigeon's. The feathers mixed with the down were small and pure white. I found a Teal's nest with eggs on June 4th. Bernacle Geese pass the Arran More lighthouse on migration, and are occasionally shot by the keeper. I found a dead bird lying upon the grassy summit of an outlying stack.

The Manx Shearwater breeds in little colonies of half a dozen pairs or so in suitable places along the cliffs of Arran More, usually choosing a steep peaty slope half-way down the cliff, sheltered from the full force of the Atlantic gales, and not too easy of access. The bird is locally known as "Puffin" or "Booty," and the sitting bird and her highly-scented egg are esteemed a dainty. This bird is courageous in disposition, will not leave its nest until drawn out forcibly, and fights savagely, inflicting sharp bites with its hooked bill, and using its sharp claws freely. On May 31st we took nearly fresh eggs, and others much incubated.

* Mr. Howard Saunders, in the new edition of 'Yarrell's British Birds,' issued September, 1884, had already suggested that the Red-throated Diver was an Irish breeder, and had directed attention to Donegal as a probable locality.

On May 31st a fisherman brought us alive three Storm Petrels, which he had taken that morning from their holes. We liberated them, and induced their captor to take us to the place—a peaty slope two hundred feet above the sea, almost inaccessible. On June 3rd, and again on June 5th, I visited the holes: there were many old and new, most opened westward. About twenty contained nests, little pads of white grass, placed not quite at the end of the hole. There were no eggs laid at the time of my last visit, though most holes contained one bird, and some a pair, which proved their relationship to the Shearwaters by fighting valiantly. There note was a squeak. No Fork-tailed Petrels were found, but one of the men asserted that he knew the bird. On June 25th I received eggs from this colony; one was much incubated, but most were quite fresh. The Storm Petrels of Arran More would appear to be somewhat early breeders. I noticed that the nostrils of the Storm Petrel differed from those of the Shearwater, which open upward rather than forward, and consist of two separate tubes; those of the smaller bird appear at the orifice as a single tube divided by a thin vertical partition.

Whilst investigating the Petrels' breeding holes, a Wheatear's nest and eggs were disinterred; and from two other holes, nests and eggs, which I believe were Reed Bunting's (*E. schœniclus*). The eggs agree, and the absence of feathers in the nests, which consisted of white grass stems, leads me to this conclusion, although no birds of this species were seen, or known to breed, for miles around, and the position of the nests was certainly unusual, placed at the extremity of small burrows, two feet in length, upon the summit of an isolated skerry, destitute of tree or bush, or so much as a tuft of rushes.

The keeper of the lighthouse upon Arran More showed me several Snow Buntings in nuptial plumage, shot there, and mounted by himself. One was killed about the middle of April, he said.

On May 23rd I saw a Twite's nest and eggs built among the highest rocks of Arran More. This is probably the most numerous of the genus in this district, although the common Linnet breeds pretty freely, and I found the Lesser Redpoll nesting in a Fuchsia bush in the agent's garden upon the island. The willows being late last May, the bird had failed to find enough

white down for lining, and had eked out the supply with gray feathers of the domestic fowl.

The Goldfinch was nesting in the same garden. This bird is common in the Rosses wherever a few trees or bushes afford it cover. I cannot remember seeing the Chaffinch or Greenfinch. A Blackbird was seen in the agent's garden, and Wrens and Yellow Hammers were nesting around the premises.

The House Sparrow seems universally distributed; a pair or two frequenting each cabin, save in the very wildest glens.

On May 23rd I saw a Tree Sparrow rise from a stone wall among the scattered cabins on Arran More. It was accompanied by one or two other birds which I failed to identify. On two subsequent occasions I had good views of this or a similar bird. When last seen it was perched upon the roof of a low cabin, and permitted a near and deliberate inspection. I doubt if more than one pair were on the island. I saw none at Burton Port or Acres, which are the nearest villages upon the mainland, nor at Dunglow, nor at any of the numerous cabins along the roadside between Strabane and the coast. Having found it in various unlikely spots among the Scotch highlands on other occasions, I kept my eyes open especially for the Tree Sparrow whilst in Donegal, and had quite given it up when I came upon it, as related, above one hundred and fifty miles from its nearest recorded Irish station at Dalkey, on the east coast near Dublin.

On May 31st I saw a Stonechat on Arran More, and found a colony of Starlings breeding with Rock Doves in some sheltered cliffs. I had noticed no Starlings since leaving Stranorlar on the other side of the county. The local fishermen had no special name for them, calling them "Blackbirds;" hence it is possible that this is a recent extension of the Starlings' range.

No Ravens were seen. This species has lately been much reduced by poisoning. Hooded Crows are common. The Chough is common on Arran More. I believe it has exclusive possession of the island, as no Jackdaws were seen there, nor on the low in-shore islands adjacent. At Crohy Head, a few miles south, the Jackdaw abounds, breeding in close proximity to a few pairs of Choughs, and displaying no animosity to them.

Though not nesting in companies as do Jackdaws, the Chough is a very sociable bird, going about in little parties of eight or

ten, toying with one another, and running in and out of holes which contain no nests. When seeking for food in company one will feed the other. The nests were usually inaccessible. One which I examined was less bulky than a Jackdaw's, more green moss being used and less wool; the frame-work was of heather twigs. By May 25th four young were hatched. The legs, feet, and claws were flesh-coloured, the beaks large and of a lovely coral pink. By June 5th the legs were a dull orange colour, and the bills blackish with flesh-coloured tips and edges.

The Rock Dove abounds, and is the only Pigeon of this district.

As might be expected the Rock Pipit is common. The size of the eggs from different nests varies much.

On Rutland Island, which is level and sandy, Skylarks are common. The Swallow and Swift were seen, but are not common.

Wherever there is a patch of meadow grass the Corn Crake is seen. I use the word purposely, for in the Rosses this bird is as bold as the Moor Hen is in England; running, standing, and croaking in full view, and frequently taking short flights.

Common Bunting and Meadow Pipit are generally distributed.

The Rook seems to have been recently exterminated in the district near the sea, reappearing fifteen miles inland.

I saw a Heronry on an island in a mountain lough some miles from the coast.

The Peregrine is still to be seen upon Arran More, but the White-tailed Eagle is, I am afraid, quite extinct—the effect of poison, I was told.

Gray Wagtail and Ring Ousel were noticed about fifteen miles from the sea; Chaffinch, Coot, and Dipper about twenty miles; Greenfinch and Missel Thrush about twenty-five. The House Martin did not appear until I reached Stranorlar—say thirty miles from the coast.

Birds were abundant, but the number of species few; only about two-thirds of what one might fairly expect to see in the north of Scotland during the same period at this season.

From May 21st until June 7th Turnstones in parties of a dozen or so frequented the coast line. A flock of thirty seen on the Roannish Islands were in all states of plumage.

Purple Sandpipers in pairs, but exhibiting no intention of

nesting, were seen at close quarters almost daily, always close to the water's edge.

A Sanderling seen on Rutland Island May 25th, and Dunlins, with and without the black breast, on the same date. Ring Dottrel with eggs on the same date.

The Common Gull breeds pretty freely in this locality.

In conclusion, I repeat that these disjointed notes have no pretension whatever to completeness. I carried no gun, and several obscurely coloured little birds escaped identification. Plenty remains for any one to do who shall go to the district with an eye for natural history. The sea-fishing is excellent, and easily accessible from Burton Port. The people are gentle, intelligent, and well-disposed; not extortionate, not mendicants, but all that one could desire in the way of boatmen, comparing in every respect most favourably with the vulgar and rapacious fellows I have endured the company of at other places nearer home, and I should be ungrateful not to mention them with respect.

VII.

NOTES ON SOME RECENT EXPOSURES OF THE "FOREST-BED" NEAR CROMER.

By A. C. Savin.

(Communicated by T. Southwell.)

Read 31st January, 1888.

During the past two months (November and December, 1887) several good exposures of the Forest-bed series have occurred in the neighbourhood of Cromer, an account of which may prove interesting to some of the members here present. The first in importance was midway between Cromer and Overstrand, at the base of the shingle, about fifty yards from the cliff. Here a good section of the Weybourn beds was seen, consisting of extensive beds of clay-pebbles

and occasional mammalian remains. No shells occurred, with the exception of one valve of *Mytilus edulis*. This is rather strange, as this bed in most instances (East Runton, &c.) is crowded with shells. Cakes of peat, blue clay, and gravel, representing the Forest-bed, rested immediately on the bed of clay-pebbles, clearly showing the Forest-bed occurs above the Weybourn beds, and not beneath, as some Norfolk geologists maintain. Many stools of trees were seen, several being from 16 inches to 2 feet across. They were evidently not *in situ* or rooted in their original position, as all the small roots were missing, and the larger ones extended but a short distance and were much abraded at the ends. Several large trunks occurred, seemingly of Fir, one being 25 feet in length, with a diameter of 16 inches. Others were from 12 to 20 feet long. A rather curious point in connection with them was the uniform direction of the trunks, viz., the roots to the north and the tops to the south. If one could ascertain the position they would occupy in drifting down a stream, it would prove an easy task to point in which direction the Forest-bed river flowed. Many of the large masses of peat contained great quantities of the root-stocks of the *Osmunda regalis*: they were much decayed, and very soft, but I obtained some six or seven in fair preservation. No other instance has occurred to my knowledge of so many being found together. The following are some of the principal mammalian remains obtained:—Tarsal and carpal bones of Elephas, astragalus and calcaneum of Cervus, portion of Hyæna's jaw, upper molar of *E. antiquus*, tooth of Equus, canine of Hippopotamus, tibia joint of Bos, and part of an upper incisor of Trogontherium. On the north-west side of Overstrand gangway several tree trunks were shown in the base of the cliff, one trunk passing upward into the boulder clay, which here cuts down to the Forest-bed to the destruction of all intervening deposits.

Early in October a fine section of the Sidestrand Unio-bed about 300 yards in length was shown, resting directly on the Forest-bed. The base consisted of gravel about 18 inches in thickness with fragments of Unios, then 4 feet of black mud full of Unios of all sizes. Several were extracted whole, but the majority are decayed and very soft, and require to be carefully dried and then gelatinized. A few fish bones were found, but no mammalian remains, indeed the latter are very rare. I have only obtained a caudal vertebra of *Myogale moschata* from this bed. From a low on the foreshore

opposite the old church, during the present winter I have found a canine of Hippopotamus, second milk molar of *E. antiquus*, Cervus jaw, metatarsal of *Canis vulpes*, upper and lower molars of Equus, astragalus of Rhinoceros, various limb bones of Cervus and Equus, and a frontal with one horn-core of Bison. This specimen is now in the hands of Mr. E. T. Newton for indentification.

Turning now to the north side of Cromer, several good exposures have been noted about half way to East Runton, many cakes of peat and a few stools of trees in the same condition as those at Overstrand, all the roots broken short. It is remarkable that no bones are found in this section. I have explored here for years, but never discovered any remains of animals. Travelling onward in the direction of East Runton, the bed of "Pan" is reached from whence the large tusk was obtained. This deposit was well shown a short time back, in many places being quite 6 feet in thickness, resting on finely laminated clays. Very few bones occur in the above bed, and those in a fragmentary condition, and very difficult to extract. Midway between the last-mentioned deposit and the gangway large patches of pan were seen on the foreshore, chiefly composed of sand, and not so hard as that forming the base of the cliff. The fossils obtained from this section are: – A fine upper molar of *E. antiquus*, the plates just coming into wear; a foot bone of Elephas, metatarsal of Cervus, and a fine frontal with the left antler complete of *C. bovides (Alces latifrons*, Dawkins*)*. This is an interesting specimen of the above rare species: the great thickness of the frontal, the extreme shortness of the pedicle, and total absence of tines, separates it from all other known forms. I possess several good specimens of this species, but the last found has a greater ogee curvature than any of the others. Many curious red sandy concretions occur near the gangway: they are about 1½ inches in thickness and from 2 to 8 feet in length, and quite hollow, resembling the trunks of trees. Immediately on the north-west side of the gap a ledge of rocks run out to sea at right angles to the coast, and after storms, when the flints have been disturbed, forms a good collecting ground. When the Forest-bed is denuded the Weybourn Crag is given to view, and large quantities of shells can be procured. Several colonies of *Cyprina islandica*, *Astarte borealis*, *Tellina balthica* and *obliqua*, &c., were found. The first mentioned are difficult to extract whole. Many bones of *Platax*

Woodwardi occur, including the well known butterfly bones. The following remains from the Forest-bed at this place have recently been found :—Two scapulæ of Cervus, metacarpal and metatarsal of Equus, a cetacean vertebra, astragalus of Equus, foot bones of Elephas, including an astragalus, tibia of Bos, atlas of Elephas, lower canine of *Ursus spelæus*, and several antlers of various species of Cervus. This concludes all of interest which I have noted during the present winter.

VIII.

THE HABITS OF THE SERIN FINCH (*SERINUS HORTULANUS*).

By Rev. H. A. Macpherson, M.A.

Read 31*st January*, 1888.

The recent addition of the Serin Finch to the Norfolk list suggested to the writer, that a few words upon that species might find acceptance with some whose opportunities of study may have been more scanty than his own. In June last search was made for Serin Finches in the Rhine valley, about twenty miles north of Basle, and not entirely without success. In 1884 the presence of this Finch among the gardens of Badenweiler had attracted notice, and suggested further research. In 1887 the Serin Finch proved to be holding its own among the orchards which cover the hill-sides between Mulhausen and Badenweiler. A lively twittering generally first indicated the Serin's presence, usually perching on a straggling spray of some old apple tree, and though restless, and therefore difficult to study, the fearlessness displayed was interesting. Thus, on June 22nd, a male Serin flew down to a small pool in a half-dried water-course, and pitching within arm's length of two washerwomen, proceeded to satisfy his thirst in a leisurely fashion, after which he dashed off to an apple tree and there recommenced his twittering song. It was pleasant to meet with these cheery little birds at intervals on a hot summer afternoon ; their strong-

hold in the district lay on the left bank of the Rhine, at Mulhausen in Alsace. That great manufacturing centre straggles over many acres of level ground, but a sharp rise occurs on the east side of the railway station. This is the favourite quarter of residents, and a large area is covered by villas standing in their own walled gardens. As the ascent continues, the gardens become scarce or disappear; their place is taken by vineyards, flanked on all sides by tall palisades, and planted at intervals with fruit trees. Finally, the higher ground is clothed with a magnificent beech-wood, chiefly tenanted by Chaffinches and Carrion Crows, but resonant (in June) with the high-pitched shivering song of the Wood Wren (*P. sibilatrix*).

No Serin Finches were detected in the forestry, but the gardens and vineyards immediately beneath proved to hold many; and though the fences prohibited a search for nests, the height at which the birds generally flew, sporting actively hither and thither in bright sunshine, rendered a study of their habits not impossible. Their sprightly movements, singing on the wing, recalled to the writer the habits of the Siskin as studied in Norway, but perhaps resembled more exactly those of the Lesser Redpoll. The peasants on the spot stated, when questioned, that the Serins generally nested in fruit trees, but in the Mulhausen district fir trees were manifestly preferred to apple trees. One pair in particular received a careful scrutiny. After toying for some time about an orchard, they flew together to a fir tree; thence the female slipped quietly away, apparently to her nest. Her companion became restless in solitude, and fidgeted anxiously along the entire length of a large bough, occasionally preening his feathers, but evidently waiting for his mate's return. After a time he became more reconciled, and began to sing steadily. The song is most frequently uttered on the wing, and the paired birds were never far apart. Usually they flew in company. On this, as on previous occasions, the writer was baulked of the pleasure of examining a Serin's nest, by the fact that the species constantly nested in private grounds, and was legally protected.

A nest examined in the museum at Geneva was a small spherical structure of moss, not unlike that of the Goldfinch, and had been built in the support of a small fork, at the extremity of a long slender tree-branch. The eggs exhibited were of the usual type.

At Geneva, the writer observed the Serin Finch only on the edge of gardens, nor was it a common bird. Two examples caught in the environs became charming pets, and lived together pretty amicably, though when a bone of contention arrived the little fellows scolded and upbraided one another like Goldfinches. They exhibited a trait often remarked in the Siskin, in their preference for roosting upon the wires of their cage. They were fond of crouching close to a perch, and spreading out the flank feathers, when they looked wonderfully like miniature Yellow Hammers. The male's song was likened to that of the Canary, though far less varied; his call-note, when agitated, might be rendered by the words "pen and ink." In hot weather these caged Serin Finches bathed frequently, and to sprinkle water playfully around was an unfailing amusement. In the absence of parental cares, they devoted great attention to their toilet, the male especially taking pains to adjust each feather with dainty precision. Such other Serin Finches as the writer has kept in confinement, with one exception, were imported from Spain or procured in the Paris bird-market in spring or autumn. Large numbers are caught near Paris in October. But although the number recorded as actually obtained in England is at present small, it should be remembered that this is partly due to the difficulty of authenticating specimens taken to dealers by birdcatchers.

In 1883 Mr. W. Swaysland offered for sale two Serins caught near Brighton on the 21st of March, stating that the species occurred nearly every year. Mr. Swaysland often imports birds, and therefore his evidence is scarcely unimpeachable. But Mr. Verrall of Lewes, a high authority on the small birds of the Sussex coast, remarks (*in litt.* December 3rd, 1887): "I have Mr. Howard Saunders' list of British Birds. I do not think that the Serin Finch should have been printed in italics. These birds are more common than is generally supposed. When caught they are taken and sold as Hen Siskins. The one I bred the mule from (Serin and Canary) that you had, was purchased by myself of a catcher in London, who was sure it was only a Hen Siskin. Every year or so a few are caught on the south coast." This statement from a practical man (Mr. Verrall is an amateur birdcatcher for his own amusement, and a very clever one) was unexpectedly volunteered, and may be taken for what it is worth.

IX.

NOTES ON THE HERRING FISHERY OF 1887.

By Thomas Southwell, F.Z.S.

Read 28th February, 1888.

In the midst of the deep depression which has so long prevailed in almost every branch of industry, it is pleasing to be able to point to one bright spot in the gloomy prospect. There can be no doubt that, compared with the results of the past few years, the autumn Herring voyage, especially from Yarmouth, has been a fairly successful one, and that both curers and boatowners, more particularly the latter, who have been such severe sufferers of late, have every reason to be satisfied with their "making up." There have been no extremely high prices; and the catches, although frequently very good, have not been extraordinary; the quality also has been fairly good on the average. But the two circumstances which have tended so much to help the boatowners and men are the absence of the gluts which in previous years have had such a disturbing effect on the markets, and the fact that, with the exception of the latter half of October, the weather has been exceptionally fine, resulting in a freedom from the heavy losses of boats and gear which so frequently blight the prospects of what might otherwise have proved a successful voyage. As Lowestoft makes a greater feature of the Spring Fishery, which as I shall have to explain further on proved as usual a failure, the commercial result for that port for the year would not be so good as Yarmouth, but I think with the result of the autumn voyage from Lowestoft there was every reason to be fairly satisfied.

In my remarks last year on the pernicious effects produced by the use of too small a mesh in the herring nets (pp. 377—8), I gave some extracts from the report of the Scottish Fishery

Board, showing that to this cause might be attributed to a very great extent the unsatisfactory condition of the Scotch Herring Fishery, and in proof of this assertion I quoted statistics given by Professor Ewart, showing that whilst in 1860 over 192,000 barrels of full "crown brand" Herrings were branded and only 171 barrels of matties, in 1885 the proportions were 200,000 full and 300,000 matties. Referring to the important fishing station of Peterhead in the season of 1886, Professor Ewart speaks (Report p. xxxvii.) of the greatly improved quality of the fish landed, the proportion of full crown and matties being about equal, and states that the use of a wider mesh than those recently employed has "without doubt materially led to such a favourable result."

In the Yarmouth fishery the importance of the size of the mesh is forcing itself upon the owners, and the tendency has been in the direction of an increase in size. But for the lamentable season of 1886, which caused the owners to economise in the matter of nets, making their old ones do duty where possible, there would doubtless have been a further improvement in this respect; but as last season has been fairly remunerative, it is probable that many new nets will be made, and I am informed orders have already been given for nets of twenty-nine and a half meshes to the yard. With regard to Lowestoft, as the greater portion of their Herrings are landed fresh, the owners appear to be of opinion that fair-sized Herrings answer their purpose quite as well as extra large ones, more especially as they can secure a greater number of the former than they could of the latter. It is probable therefore that they will continue to use nets of from thirty to thirty-two rows per yard, which, however, is an improvement upon the mesh frequently used a few years ago. The Yarmouth fishermen, although they fully acknowledge the rights of the Scotch boats to fish in our waters, still protest against their using the small-meshed nets which so many of them employ, and complain that, having ruined their own fishery, were it not for circumstances (weather, &c.) over which they have no control, they would soon reduce our fishery to the same plight.

I have said the Lowestoft Spring Herring Fishery was anything but a success. In February a few lasts were landed, the number increasing in March, but both quality and price were wretched. April is the height of the season, and 988 lasts were landed; but

the markets grew worse as the quantities increased. A boat called the "Reliance" is reported to have brought in 80,000 fish which were sold at 1½d. the hundred of 132, but as the landing dues, the cost of counting, and the salesman's commission had to be paid,* it is obvious the "Reliance" would have been better lying in the harbour, notwithstanding her—so far as numbers were concerned—successful catch. Other boats about the same time threw their catches overboard as it would not pay to land them, and for these fish the men had been outside the Knowl, a distance of about twenty-one miles. In May 613 lasts were landed, but with no improvement as to price. Summing up the spring voyage one report says it has been one of the worst on record, and that the average price of Herrings has been only about 6d. per hundred (50s. per last), whilst in many cases the catch has not realised more than 1½d. per hundred; the result of the ten or twelve weeks' labour in many cases has been 10s. per man, and in other instances the boats have paid nothing. A few "Midsummer Herrings" are landed at Lowestoft in the months of June and July; they are of excellent quality, and fetch good prices.

In October the arrivals were 2053 lasts, and the quantity not being in excess of the demand, good prices were realised, in one instance as much as £27 10s. per last. In November the quantity landed was 3953 lasts, and 1307 in December, an unusual number for the latter month, and as prices still ruled fairly well, many of those who had been behind were enabled to bring their voyage to a successful close.

The North Sea voyage lasts from the end of July to late in

*The expenses attendant upon landing Herrings at Lowestoft are: Landing dues, 2s. 6d. per last; counting, 3s. per last; salesman's commission, 5 per cent. on the amount realised; and harbour dues, 20s. per year for each vessel if compounded for, or 1½d. per registered ton each time of coming into port.

At Yarmouth the charges are: Wharf dues, 1s. 8d. per last; counting, 3s. per last; commission, 5 per cent. Port dues, if compounded for 1s. 9d. per registered ton per annum, otherwise 3d. per registered ton, and 1s. 8d. per last on the quantity on board each time of entering. Lowestoft boats which come into Yarmouth only occasionally, sometimes pay 20s. port dues for the season (say 1st July to December), and 1s. 8d. a last on all Herrings landed.

Wharf dues for trawl fish are 1d. per package, mackerel are charged 2d. per hundred.

September, during which time very few Herring are landed at Lowestoft (as explained *ante* p. 380); towards the end of September the home voyage commence, when our fish wharfs both at Lowestoft and Yarmouth present a busy scene. From that time the voyage was continued almost without a break till its close, the only exception being the last two weeks in October, which were stormy and some losses of nets occurred. But the weather was never bad enough to keep our large luggers at home, whereas the Scotch boats were often compelled to remain in harbour, and this enforced idleness produced a very beneficial effect upon the market, prices remaining firmer than usual, and the sudden gluts so frequently experienced last year, which resulted in many tons of fish being used for manure, were unknown. Notwithstanding therefore the deliveries at Yarmouth being some two thousand lasts short of those of 1886, the general result has been much more satisfactory. A large boatowner assures me that he never worked a season so agreeably and with so little anxiety, everything seemed to tend to keep the supply just below or equal to the demand and never in excess, but that had the catches been larger very disastrous prices would have been the consequence. Just at the last three weeks, after the Scotch had departed, the home boats struck a splendid shoal of fish. The weather remained propitious all the time, and they ran out, returning laden with Herrings which, owing to the previous scarcity, and the improved tone of the foreign markets rendering prices firm, enabled them to reap a splendid harvest at the last.

Two shoals are spoken of as having been met with off Yarmouth, one from thirty to forty, and the other from sixteen to twenty miles away, and between these very few fish were taken. There appears to have been a falling off in the number of Scotch boats which visited both Yarmouth and Lowestoft, probably to the extent of about fifty, but the number of home boats remained much the same as last year. The Scotch boats on the whole did better than last year, a few making a really successful voyage; but nearly all suffered from loss or damage to gear, arising from bad weather or weight of fish, and some are said to have lost every net. The Lowestoft boats as usual suffered severely from injuries inflicted by the Ostend trawlers, an evil from which the Yarmouth boats are practically exempt. This arises from the latter going further north-

ward to fish, and thus they only meet with an occasional straggling Ostend boat; whereas the Lowestoft Herring and Mackerel boats fish generally abreast, or to the southward of their port, and right in the course of the Ostend trawlers.

The price realised in the autumn voyage may be fairly averaged at £9 per last, a very material improvement upon that of 1886.

I have again to express my thanks to Mr. H. Teasdel, Jun., the Yarmouth Corporation Accountant, and to Captain Massingham of Lowestoft, for the official returns from these ports, also to Mr. A. L. Gowing of Yarmouth, for his kind assistance.

RETURN OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1887.

		Yarmouth.			Lowestoft.		
		Lasts (13,200).	Thousands (1320).	Hundreds (132).	Lasts (13,200).	Thousands (1320).	Hundreds (132).
Spring	January	—	—	—	—	—	—
	February	11	6	0	118	4	2
	March	129	2	2	581	9	3
	April	168	9	5	988	—	—
	May	14	2	5	613	8	2
Summer	June	47	5	1	179	9	1
	July	35	7	3	62	—	3
	August	812	6	6	119	7	1
Autumn	September	2881	—	4	175	7	6
	October	4615	7	7	2053	7	—
	November	7141	7	7	3953	6	2
	December	2894	9	2	1307	8	3
		18,753	4	2	10,154	7	3
		10,154	7	3			
		28,908	1	5			

X.

FURTHER NOTES ON THE SMELT FISHERY IN THE NORFOLK WATERS.

By Thomas Southwell, F.Z.S.

Read 27th March, 1888.

In November, 1886, I had the honour of reading before this Society some notes on the Smelt Fishery in the Norfolk Waters, which appeared in the pages of our Transactions (*ante* p. 338 *et seq.*). Quite recently I have received, through the kindness of a friend, a paper on the same subject, with which I was not at that time acquainted. It is written by Mr. Charles W. Harding of Lynn, and appears to have been contributed as a prize essay to the International Fisheries Exhibition, 1883, and was awarded a "diploma." It is therefore probably published in the volume of prize essays issued by "the Commissioners appointed by her Majesty's Government," by whom, upon the recommendation of the jury, the diploma was awarded; but never having seen the volume in question, this is, of course, only conjecture. Coming from a person so well acquainted with the fisheries of the estuary of the river Ouse as Mr. Harding, this essay is of great value as showing the present state of the Smelt Fishery in that locality; and his original observations are so interesting, that I need make no apology for asking the permission of our Society to allow me to communicate their substance, for the purpose of placing them on record where they will be accessible to us all. The lamentable disclosures contained in Mr. Harding's essay are a practical comment upon the wise regulations quoted as prevailing in the same river three hundred years ago, in a paper I read before this Society (*ante* p. 445).

In the summer of 1882 Mr. Harding says that he sent out circulars to sixty-six ports, asking for information as to the regulations in force with regard to the Smelt Fishery in each port. Of the fourteen returns received, eleven speak of a decided decrease in the number of Smelts taken; and in a twelfth, although no such decrease is specified, it is stated that "enormous quantities of young Smelts are yearly taken by the Whitebait fishers." In ten cases it is stated that no regulations for the preservation of the fishery exist; and in one instance where this specific information is omitted, it is added, the Smelts "have decreased very considerably of late years." In only three instances out of the fourteen is it stated that any attempt has been made to regulate the fishery in any way. These exceptions are Breydon, Norfolk, which is worked under the Norfolk and Suffolk Fisheries Act of 1877, the provisions of which I have explained in a former paper (*ante* p. 340); Rochester, which has a close time from 1st April to 30th June, the mesh of the net used in that locality from 1st July to 31st October is fixed at $1\frac{1}{8}$ in., and from 1st November to 31st March $1\frac{1}{4}$ in., the length of the nets not to exceed 35 fathoms, no trim or stow nets, or any fixed engines are allowed in the Medway, and the bye-laws are made at an admiralty court. The catches of Smelts here vary very much, and there have been good and bad seasons alternately. The third protected fishery is in the river Forth, where the close time is during the months of "May, June, July, and August." The nets used are draught and a boom net, which is a fixture. There is no restriction as to size of mesh, and the number of fish taken has diminished to such an extent since 1864, that previous to that time "as many were caught in one day as are now obtained in two or three seasons." The fishermen ascribe the decrease to the large quantities of ice which came down the Forth in the winter of 1864; but Mr. Harding's correspondent "is of opinion the scarcity is owing to the killing or destroying of so much of the Smelt fry during the months of September and October," and considers that the close time should be extended to the end of October; but he does not suggest any alteration either in the size of mesh or the abolition of fixed nets.

It is evident from the imperfect returns rendered to Mr. Harding, that the amount of interest taken in the Smelt fisheries of the

United Kingdom, either by the imperial or local authorities, is small indeed, and that this delicate and delicious fish is, from utter neglect and unfair treatment, becoming lost as a source of food and profit in the localities where it formerly abounded. It would be interesting to inquire to what extent we are now indebted to foreign supply for the Smelts which find their way into our markets; and it will readily be believed how seriously so delicate a fish suffers in quality by transit and keeping,—in fact a Board of Trade inquiry into the whole subject seems highly desirable.

Mr. Harding's practical investigations with regard to the reproduction and habits of the Smelt are so interesting that I venture to quote them at length, observing that I have not had an opportunity of inspecting the samples and photographs referred to, nor have I, owing to the regrettable state of Mr. Harding's health, been able to communicate with him or to obtain any information regarding them. The presumption, however, is that they were sent in with his paper to the Commissioners of the 1883 exhibition.

"From observations of the habits of the Smelt in the river Ouse, and other rivers in Norfolk, I find they spawn where the water is fresh about the middle of April. The spawn is deposited on sticks and stones in the river, and is not covered up, as with the larger members of the Salmon family. It is not long before the young fry are hatched out, and their growth is speedy for the first six weeks, and by the decline of summer, they are between three and four inches long.

"The growth of the young Smelts in the Ouse during the season 1882—3 is shewn from samples taken from the river during that period, some of which I have had photographed, to shew the progressive growth.

No. 1 were taken on 2nd June, 1882, and were about five weeks old. They averaged about 1 inch in length, and it took 32,666 to weigh 1 lb. avoirdupois.

No. 2 were taken on 15th June; average length, 1¼ inch, 8166 to the lb.

No. 3 were taken on 3rd July; average length, 1⅝ inch, 1195 to the lb.

No. 4 were taken on 18th July; average length, 2¼ inches, 716 to the lb.

No. 5 were taken on 31st July; average length, 2⅝ inches, 448 to the lb.

No. 6 were taken on 10th August; average length, 2¾ inches, 358 to the lb.

No. 7 were taken on 29th August; average length, 3¼ inches, 224 to the lb.

No. 8 were taken on 28th October; average length, 3½ inches, 210 to the lb.

No. 9 were taken on 23rd November; average length, 3⅞ inches, 195 to the lb.

No. 10 were taken on 6th January, 1883; average length, 4 inches, 149 to the lb.

No. 11 were taken on 24th March; average length, 4 inches, 112 to the lb.

No. 12 is a sample of the Yellow Gobies, which are caught in the trim nets by millions.

No. 13, young Sprats, also caught in the trim nets.

No. 14, small Shrimps, also caught in the trim nets.

"The Smelts appear in a great measure to feed, while in the brackish waters of the rivers, upon the fry of Sprats and Herring, small Shrimps, and the Yellow Goby (*Gobius auratus*). The average weight of the Gobies taken in the river is 640 to the lb.; the young Herrings and Sprats average 3360 to the lb.; the Shrimps weigh 21,942 to the lb. These fish appear to form the principal food of the Smelt while in the rivers.

"I find that an average-sized female Smelt contains 12,000 eggs, and, from the large quantity which spawn in the Ouse every year, the river ought to team with Smelts, and would, but for the eight or ten trim or stow nets set for their capture. Last June, the net set to catch samples with was covered with young Smelts a few days old (see photo' No. 1). They were caught and destroyed in the meshes, and I counted as many as 800 in one square yard of it. The number destroyed every day by the huge nets set in the river must amount to tens of millions. As can be seen by the photograph, they are not the slightest use either for food or bait at this age. In addition to the destruction caused by the fixed nets to the Smelt fishery, myriads of Shrimps, Herrings, Sprats, Yellow Gobies, Anchovies, and Whiting are daily destroyed.

"These trim nets are set open to the tide by means of three poles; each pole is seventeen feet long, so that the mouth of the net is a large triangle seventeen feet on each side. The consequence is, that it catches everything which moves in the river—fish, fry, and spawn—and keeps the river and the adjacent sea or estuary outside in a state of the greatest destitution; as has been proved in America, where the river or anadromous fish have been exhausted, the Pelagic fish, or sea fish proper, have deserted that part of the coast. The Sole fisheries of the Wash have fallen off of late years, and I am very strongly of opinion that, if these millions upon millions of Smelts, Sprats, Herrings, Shrimps, Gobies, Anchovies, Whitings, &c., were allowed free action in the river, they would so increase and multiply, that the Soles and other sea-fish would be again attracted to the Wash in large quantities. This has been found to be the case over and over again in America. In some

of the rivers of America. Smelts are only allowed to be caught by rod and line; and bricklayers and other mechanics, who cannot work at their trade during the frosts of winter, are enabled to catch from two to three dollars' worth of Smelts a day, with a beam pole, and a line and hook. This is more particularly carried on with success at Lynn, Mass., amongst other places. In Maryland, large quantities are hatched artificially, and turned off into the rivers. By so doing, ninty-nine per cent. of the eggs become fish; whereas, if left to nature, not more than ten per cent. become fish."

Mr. Harding concludes as follows:—"I am of opinion that, if the regulations and restrictions of the Norfolk and Suffolk Fisheries Act, 1877 are rigidly enforced, and a little money spent upon artificial hatching, the river Ouse in two years' time will become well stocked with Smelts and other fish; and when that takes place, I have every reason to believe that Soles and other sea-fish will be attracted into the Wash in much larger quantities.

"I have been told, upon reliable authority, that 300 bushels of shotten or spent Smelts have been caught and sold in Lynn during the first two weeks of this month of April [1883]."

I think it will be found that these large quantities of unseasonable Smelts are taken in the great Fen drains which discharge into the river Ouse some miles above the town of Lynn, and that they are out of the jurisdiction of the Conservators under the Act of 1877. But whilst the use of stow nets, ostensibly to take bait for eel fishing, with a mesh small enough to stop even shrimps is allowed, even where the Conservancy Board is supposed to have power, very little can be done. In 1884 a prosecution was instituted by the Lynn authorities against some of these so-called bait fishers, the defendants being charged with taking Smelts during the close time established under the bye-laws of the "Norfolk and Suffolk Fisheries Act, 1877," also with using a net having a mesh of illegal size; but strange to say the magistrates decided that Smelts were not "fresh-water fish," and therefore the Conservators had no power to make laws concerning them; a decision which if maintained would be fatal to the excellent bye-laws now in force with regard to this fishery throughout the two counties. But it is scarcely to be believed, as pointed out by Mr. Edward Field, the late honorary secretary to the Conservators, that the inspectors of fisheries would have allowed, or Her Majesty's principal Secretary of State would have sanctioned, special provisions for the protection of Smelts, if they

had not considered them to be strictly within the operation of the Act.

Emboldened probably by this decision, the river fishermen of Lynn have recently petitioned for an extension of the time when it shall be legal to take Smelts, from the 31st March as at present fixed, to the 30th April, a request very wisely declined by the Board of Conservators. It appears desirable that the term Fresh-water Fish, as used in the Act of 1877, should first be clearly defined, and then that the salutary bye-laws framed by the Conservators should be strictly enforced in the river Ouse as elsewhere.

XI.

ON THE VOCAL AND OTHER SOUNDS EMITTED BY THE COMMON SNIPE (*SCOLOPAX GALLINAGO*).

By H. Stevenson, F.L.S.

Read 27th March, 1888.

Extensive as is the literature connected with the drumming, etc., of the Snipe, the following transcripts from my note books, of observations made under exceptional, and peculiarly favourable, circumstances, may perhaps be acceptable to naturalists and ornithologists in particular.

In the first week of May, 1883, when suffering from insomnia, the outcome of severe neuralgia, I determined to try the effect of change of air and scene by the river side, and therefore took up my quarters at the "Yare Hotel," well known to more than local anglers, closely adjoining the Brundall Station, on the Yarmouth line. I was at once in a fine marshy district bordering the river, and by it only, separated from Surlingham Broad.

As all frequenters of this locality know the pathway from the station to the ferry at Coldham Hall is bordered on the left by a

wide stretch of marshes, fairly dry in summer, but with "pulk holes" and "plashes" here and there, and divided by various dykes filled with a profusion of aquatic herbage—Meadow Sweet and Ragged Robin, as usual, predominating. On the right is a wild expanse of sedge and reed, fringed in summer with the gay Marsh Marygold and the Bird's-eye Forget-me-not, but, unlike the opposite marshes, a treacherous soil to traverse, and the haunt of numbers of Sedge Warblers and Black-headed Buntings.

Being well known at the hostelry, I had no difficulty in taking "my walks abroad" at any unconscionable hour, without disturbing other inmates, and on the morning after my arrival, the 5th of May, when turning out at 5 a.m., the first sound that greeted me was the drumming of Snipes over the drier marshes, close to the house.

It was a bright summer's morning, and I soon made out three couple of Snipes, flying in pairs, high up in the clear sky, and drumming incessantly, whilst at intervals came as distinctly a vocal sound resembling, to my ears, the word *chuka*, *chuka*, repeated rapidly two or three times, with a decided emphasis on the first syllable. This vocal note has, I know, been alluded to by many authors, though nearly all differ in the rendering of the sound itself.

This note is uttered, again and again, as the bird flies high over the marshes, but then only in its ascending flight, as the drumming is heard only in descent. But, at times this note is emitted when the Snipe is coursing swiftly over the marshes, only a few feet from the ground, and is still heard from the ground when a bird alights, presumably at its nest, in the thick herbage. I have also noticed that this vocal sound is often heard in lofty flights without any drumming succeeding, though the bird may fall rapidly (but not to settle down), and the latter seems, therefore, quite optional, and under control.

My attention had never been so distinctly drawn to this *chuka*, *chuka* note, as on this occasion, though in long summer days spent on the broads, Snipes have been drumming for hours in all directions; but on returning from Surlingham Broad to the Brundall Station late in the evening, I have often heard that sound from the same marshes.

Such being my experience in the early part of May, and to

ascertain if these vocal notes would be repeated later in the season, and at the same early hours, I again visited Brundall on the 25th of June.

By 5 a.m. the next morning I heard Snipes close to the house, flying round over the marshes and uttering the same *chuka, chuka* note incessantly, and now and then drumming, but not often. At 9 p.m. of the same day, I heard the same note, and occasionally drumming, when unable to distinguish the birds, and when big bats were on the wing,—(this reminds me of a visit to Horning, some years back, in the month of April, when walking out between ten and eleven o'clock on a bright starlight night, Snipes were drumming all over the marshes, quite out of sight, but though a curious buzzing sound occurred frequently, I heard no vocal note that I can at all remember).

The next morning when walking to Coldham Hall, at 6.30 a.m., three Snipes rose from a marsh on the left, which I watched, when sheltered by a tree. They flew low over the marshes and dykes with a wide range, and sometimes only a few feet off the ground, flying generally two together and one behind, or one leading, as the case might be. In turning sharply they passed me, again and again, within thirty yards, but never mounted up. At intervals the *chuka, chuka*, note was uttered loudly, on the wing, but seldom when flying on a level course. This was heard chiefly when they turned in flight, or changed places in their morning's round. Suddenly they stopped about the middle of a marsh, and a pair dropped, uttering the same note (one or both), into the thick herbage, and the third also within a few yards, by which I inferred that the first were male and female, and dropped to their eggs, the third probably a male whose mate was sitting on eggs or young. Whether both sexes emit the same vocal note I cannot say.

Returning from Coldham I heard a Snipe drumming, and watched it a long time. The sound was heard with the least possible "fall," and often a considerable "fall" occurred *without any sound*. Once it descended nearly opposite to me, within a few feet of the marsh, where no doubt its nest was, but seeing me, again ascended, and though I gradually increased the distance from the spot it seemed about to alight on, it continued to fly round and round, sometimes looking no bigger than a Sand Martin high up in

the clear blue sky, at other times sweeping past over the tops of the trees, its long bill distinctly visible. The flight was noiseless except a slight "buzzing" now and then, but its "play," if such the drumming may be termed, seemed lost in anxiety.

It is curious to note how differently our British ornithologists render the vocal sound. Selby remarks: "At the end of March the male commences his calls of invitation for a mate. These are always uttered on the wing, and consist of a piping or clicking note often repeated."

Thompson ('Birds of Ireland') speaks of two different notes in the breeding season, "a piping note, well observed, to resemble the sound *peet* repeated, and that which has been likened to the word *tinker*" (corresponding, I presume, to my term *chuka*). "The former," he says, "I have generally heard in the bird's ascending flight, the latter chiefly from the ground." But here the words former and latter must surely have been transposed. Thompson further states that the alarm note is *something more*, as it is uttered during the bird's evening flights to its feeding grounds, when quite unmolested.

Sir W. Jardine ('British Birds,' vol. iii.) mentions Snipes "piping amongst the herbage."

In the fourth edition of Yarrell (p. 346), the editor quotes from the 'Ibis' for 1876 (p. 310), where Messrs. Seebohm and Harvie-Brown record the fact of a Snipe having been shot from the top of a larch tree seventy feet high, and which, in that position, "was uttering its double clucking *tjick-tjuck, tjick-tjuck*."

Seebohm again, in his 'British Birds' says: "In the breeding season the note of the Snipe is a rapidly uttered *tyik-tyuk*," and asserts that this note is common to both sexes.

Macgillivray, however, gives the ascending note as *zoo-zee, zoo-zee*, whilst Yarrell himself,* writing under the signature of H. V. D. in 'Loudon's Magazine of Natural History,' vol. ii. p. 144, from an intimate acquaintance with the Snipe grounds near Yarmouth, says: "The period of pairing commences in April, at which time the *male* Snipe serenades its mate with two distinct notes, differing as widely from each other as from the cry they utter at other times, the one note may be compared to the repetition of the word *tinker, tinker*, uttered in a sharp shrill tone as the bird ascends in flight;

* *Vide* Thompson, 'Birds of Ireland.'

the other *utterance*, as he descends, is somewhat similar to the bleating of a lamb, only in a deeper tone, and accompanied by a violent vibration of the wings." The word *uttered*, in the last paragraph, evidently shows that Yarrell had not then realised the fact that the drumming is not a vocal sound.

Mr. J. E. Harting, who has devoted much observation to the drumming of Snipes, gives the ascending note as *chook*, *chook*—the nearest approach I have met with to my rendering *chuka*, *chuka*; but though my ear is pretty acute as to such sounds, certain conditions of atmosphere, or other circumstances, may convey various impressions.

The "alarm" note of the Snipe, so familiar to sportsmen when the bird is sprung suddenly from a marsh drain, or some sedgy "rond," or reed bed, on the Broads, is a quite distinct sound, and, strange to say, almost as variously rendered by naturalists.

Selby gives it as *chissick*, *chissick*, Seebohm as *skaych*; and Macgillivray as *tissick*, *tissick*; but most snipe-shooters will, I think, liken it, as I have always done, to *scape*, *scape*; which if a scolopacine abbreviation for escape—proves too often a fond delusion on the part of the Snipe.

Apart, however, from the true vocalism of this most interesting species, is the humming, drumming, neighing, or bleating,* by which terms naturalists have been long accustomed, here and abroad, to render that strange sound of the Snipe, always on the wing, which preludes the breeding season, and may be heard late into the summer.

The early impression that this sound was simply vocal has, I think, with one exception (Mr. Seebohm), been abandoned both by British and foreign naturalists, and has resolved itself into three disputed questions. Is it due to the vibrating action of the wings in the descending flight of the bird alone, to the wings and tail combined, or to the stiff outside feathers of the tail only? On these three suppositions I will quote various scientific authorities, continental and otherwise.

* Which has also given this species (Yarrell, fourth edition, p. 344) the name of "Moor-lamb" in Lincolnshire, "Heather-bleater" in lowland Scotland, the equivalent of "Air-goat" in the various branches of the Celtic language, "Chevre volant" in France, and "Himmelsgeiss" in Germany.

Gilbert White alludes to it in three different letters to Pennant;* but evidently not quite settled in his mind as to its true cause, though leaning to vocalism. In his first note, speaking of numbers of Snipe breeding in summer on moory ground near his parish, he adds: "It is very amusing to see the cockbird on wing at that time and to hear his piping and humming notes." Further on, he says: "In breeding time Snipe play over the moors, piping and humming. They always hum as they are descending. Is not their hum *ventriloquous*, like that of the turkey? Some suspect it is *made by the wings!*" But in the third letter I quote from, he writes to Pennant: "When you say that in breeding time the cock Snipes make a bleating noise, and I a drumming (perhaps I should have rather said a humming), I suspect we mean the same thing. However, when they are playing about on the wing, they certainly make a loud piping with their mouths [alluding no doubt to their ascending note], but whether that bleating, or humming, is ventriloquous, or proceeds from the motion of their wings, I cannot say; but this I know, that when this noise happens, the bird is always descending, and his wings are violently agitated."

Selby ('British Birds,' 1833) refers it very decidedly to the action of the wings: "As the bird, when this sound is emitted, is observed to descend with great velocity, and with a trembling motion of the pinions." And adds: "Their flights are performed at intervals during the day, but more commonly towards evening."

Mr. Seebohm, one of our latest authorities on British ornithology, confesses himself puzzled as to its origin, though, arguing from analogy ("a dangerous proceeding," he admits, in ornithology), he is inclined to believe that it is produced by the vocal organs, and is equivalent to the trill of the Stints and other Sandpipers. And he adds in favour of his argument: "The fact that it appears to begin the instant the bird begins to descend, inclines me to think that after allowance is made for the time it takes for sound to travel, it must really begin before the descent, whilst the bird is not moving very rapidly."

I cannot help differing from this far-travelled naturalist, through ocular and binocular evidence, and Mr. J. E. Harting and other ornithologists have satisfied themselves that this sound is produced with the mandibles closed. I can no more accept

* Letters X., XVI., and XXXIX.

Mr. Seebohm's opinion as to the cause of this peculiar sound, than that "few birds are more solitary in their habits than Snipes," or the following statement, alluding to the "here to-day and gone to-morrow" habit of the species that, on some particularly favoured marsh, they will still be "put up here and there at some distance from each other, and that observers who have been fortunate enough to remark them on migration, say that they travel singly or in pairs." As to the first of these statements I can only refer to my personal experience on one occasion ('Birds of Norfolk,' vol. ii. p. 320), when in a marsh at Horning (on the 23rd of November, 1853), I met with a similar incident to that given by Thompson in his 'Birds of Ireland' (vol. ii. p. 262). The low lands were much flooded, and the Snipe seemed to have congregated on marshes having a higher level. The moment one stepped out of the boat the scene was bewildering; Snipe to the left of you, Snipe to the right of you, *Scape* close in front of you, *Scape* at your back; it was more like a stubble field full of Skylarks during the autumnal migration than anything I ever saw. As Thompson says, the difficulty was to pick out a bird and stick to it; and though a fair shot at that time, I must own, that in this crossing and recrossing of birds, all laying close, I missed five shots with my first barrel and killed them all with the left; and if my friend and myself had carried breechloaders and daylight had lasted we should have had a big bag; as it was we managed twelve or fourteen couples without leaving that one small marsh. As to migrating singly or in pairs, as Mr. Seebohm states, I have the authority of a thorough naturalist and sportsman in this county the late Rev. J. Burroughes, that on two or three occasions he had known of extraordinary migrations of Snipe in Norfolk, where the birds kept on in continuous flights like Skylarks in southern counties, and as I have known Bramlings to do in this county. On one occasion also, near Buckenham Horseshoes, on the Yare, with snow on the ground, a migratory flock of Snipes flew so low, in passing over a fence near a gateway, that some were knocked down with sticks.

To return, however, to the drumming sound of the Snipe, it seems natural that those who presumed it to be a vocal effort only, should have regarded it as the spring call-note of the male bird to its mate; and dismissing the idea of vocalism altogether, one

might naturally have taken it for the 'play' of the cock bird at pairing time, and something analogous, though in the air, to the wing trailing of the Capercailie and the Turkey Cock at the same season, or even to that of the more diminutive Skylark, who trapes one wing and then the other, with crest erect, as he *pirouettes* round the exceedingly impassive object of his affections. Such notions, however, have been dispelled by the close observation of several who have discovered that *both* sexes emit the drumming sound, and hence may be the accumulated sound over the marshes on bright starlight nights, when the hen birds have joined their mates for a last aerial flight before roosting. Mr. Harting has quite satified himself on this point, and indeed, if my memory serves me, he once shot two Snipes which he had watched individually drumming, and ascertained they were male and female.

As to the origin of the sound, other British ornithologists, such as Jardine, Macgillivray, Hancock, Saxby, and others have attributed it to the wings. Amongst continental authors, Bechstein supposed it vocal, and Naumann, Altum, and Meves due only to the tail feathers. The latter impression seems to have originated with Herr Meves, of Stockholm, whose experiments with the stiff *outer* tail-feathers of different species fixed on wires, and drawn rapidly through the air, producing a similar though modified sound to the drumming of the bird in flight, attracted the attention of the late John Wolley, and by him a translation of an article on the subject by Meves* was published in the Proceedings of the Zoological Society for 1858. I can but thus briefly refer to this interesting paper, but may refer my readers to an admirable article on the "Humming of the Snipe" by Mr. Harting in the 'Zoologist' for 1881, and a subsequent chapter in his essays on 'Sport and Natural History,' in which he treats, *in extenso*, the views of Herr Meves and of other continental authorities, inclining himself, however, to the belief that the vibratory wings are the true cause of the drumming, but Dresser in his 'Birds

* Meves states he had convinced himself that the drumming was common to both male and female, and the sound rather deeper in the former than the latter. This is also the opinion of Professor Neilsson.

Pralle, in Hanover, observed that the bird makes its *song* or *cry* at the same time with the drumming sound, which he makes *gick, jack*: *gick, jack.*

of Europe' adheres to Herr Meves's belief in the tail-feathers only producing the sound.

That veteran ornithologist, John Hancock of Newcastle, in his 'Catalogue of the Birds of Northumberland and Durham,' also devotes much space in discussing Herr Meves's belief and his tail-feather experiments, and having repeated them himself was still unconvinced that the wings were not, at least, the primary cause of the sound. He aptly remarks: "The bird descends because the flight movements of the bird have ceased; the peculiar curve and inclination of the descent are regulated by the outspread tail, the sweep itself is perfectly steady and uninfluenced by a tremulous vibratory or 'shivering' motion of the wings." He also refers to the similar "play" of the Wood Sandpiper in spring, which produces a similar drumming sound in its descending flights. Though the outer tail-feathers of this species do not differ from those of the Common Sandpiper, the Dunlin, and Redshank, yet none of these produce the same sound, on the wing, although in each the tail feathers "are sabre-shaped, with the shaft rigid, quite as much as in the Snipe."

Both Harting and Hancock also recognise the fact that the Lapwing or Peewit, as it is commonly called, the Rook and other species produce a certain humming sound with their wings; the Lapwing especially when one intrudes on its breeding haunts, as I have had ample experience of, but this from the nature of the tail feathers can only be regarded as an analogous sound made by the wings. Macgillivray, who declares for the wing theory, remarks pointedly, "if it were produced by the voice it might be emitted when the bird was on the ground or during its ordinary flight;" but he is doubtful if it is caused by both sexes.

Mr. Lubbock calls it the call of love of the cock bird; but the late Rev. T. J. Blofeld, of Hoveton, assured me he had heard a Snipe drumming during severe weather in January*; and his old marshman Hewitt said he had noticed the same thing, and believed it preluded sharp weather, which in this instance was the

* Colonel Irby, in his 'Ornithology of the Straits of Gibraltar,' remarks that although he had never heard the drumming of the Snipe in Andalusia, yet in England, in the New Forest, he had occasionally heard them drumming of an evening, as early as the 20th of January; the weather then being unusually mild, and the locality their usual nesting ground.

case, but we all know of the early, almost abnormal, notes of Thrushes and other birds, which, though vocal, may originate from the same impulse as early drumming in the Snipe.

Both Mr. Harting in the 'Zoologist' (1881), and Mr. Seebohm in his 'British Birds,' have quoted from the appendix to the 'Birds of Ceylon' by Captain W. V. Legge, whose personal observations on the humming of the Snipe are so admirably rendered, and so true, that I cannot better conclude this paper than by repeating them, as the old idea of vocalism is quite set aside, Meves's tail-feather theory is equally superseded, and a compromise established that the wing and tail feathers are *jointly* concerned in that "mysterious sound," the vibratory motion of the wings being the main cause, and the stiff feathers of the tail feathers, spread like a fan, secondary only, like the sound produced by a thin paper blown through when spread over a comb.

"The most favourable occasion I had for observation was on the evening of the 10th of June (in Wales), when a Snipe, having young near where I was standing, drummed over my head, flying backwards and forwards, in the manner now to be described, without cessation, for a period of fifty-two minutes, timed by my watch. The aerial course taken by the bird was an ellipse of the average length of a quarter of a mile, described over where I stood, but it was sometimes varied by *her* making a figure of '8' above my head; the bird always returning to its original starting point in the air, and again making the same tour. The movement for the purpose of drumming was generally performed twice, but sometimes thrice, going and coming, making from four to six times in each figure described. It flew at a height of about a hundred yards, with a quick regular movement of the wings, and drummed in this wise. The body was suddenly turned on one side, and the bird descended rapidly for about a hundred feet, at an angle of 45 degrees, moving its wings with very rapid and powerful strokes, its tail being, at the same time opened to the utmost: having arrived at the lowest point of its descent, it suddenly turned its body in the reverse direction, that is, elevated the wing which had been before depressed, and with a short upward sweep ceased the drumming noise, and rose to its original position, continued its course for a short distance, and then descended with the same rush again. The movement was always performed with the same wing pointed downwards throughout one-half of the bird's course, that is, if it commenced to drum with the left wing down when flying from east to west, that wing was inclined downwards the next time it descended until the course was altered, and the bird flew back from west to east when usually the other wing was inclined towards. The *instant* the bird commenced its descent

the drumming noise was heard, and it continued till it finished off with a sort of whiz, directly the upward sweep, by which the bird recovered itself was performed.

"By closely watching the bird it could be distinctly *seen* that the vibrations falling on the ear *coincided exactly with the beat of the wings*, which, assisted by the downward rush through the air were the *primary* cause of the sound. The tail, however, was spread as I have already remarked, and to such an extent that it took the form of a fan, the lateral feathers being at right angles to the centre, and herein lies the *secondary* cause of the sound.

"During the drumming beat of the wing, the quills are more drawn back than in the ordinary strokes (this can be observed if the bird be closely watched), so that the atmospheric wave or air propelled by the powerful strokes of the wing is drawn through the rigid sabre-shaped and opened-out feathers of the tail, thus making the peculiar noise."

XII.

NOTES ON NORFOLK RUBI.

By Rev. E. F. Linton, M.A.

Read 27th March, 1888.

The Brambles of Norfolk well repay further research. I have not found time to stray much beyond the parish of Sprowston in search of them; yet in that limited area I have found most of those which are here commented on, and I do not think the list is yet complete. I have to thank Professor Babington and Dr. W. O. Focke for ensuring the accuracy of the naming.

Rubus plicatus, W. and N. Copses in Sprowston. This has been reported by Dr. Lowe from Wolferton in West Norfolk.

R. incurvatus, Bab. Sprowston, in a wood-side hedge. Professor Babington accepts this, but says it is not quite typical.

R. pyramidalis, Kalt. In parts of Mousehold Heath. This is not what was known as *R. pyramidalis*, Bab., a name now dropped in favour of *R. longithyrsiger*, Lees.

R. MUENTERI, MARSS. Copse and heath, Sprowston. I reported formerly *R. umbrosus*, Arrh. *R. umbrosus* is a name now dropped for Britain, and what it represented has been developed into *R. Maassii* and *R. Muenteri*. We have the latter identified by Professor Babington, and I believe the former, which is the commoner form; but this will require confirmation.

R. CARPINIFOLIUS, W. and N. Recorded in Trimmer's Flora, and quoted in Mr. Geldart's List. This I strongly suspect should have been given as *R. carpinifolius*, Bloxam, a name which had to give way to *R. umbrosus*, referred to in the preceding note. I have not come across true *carpinifolius*, though it may exist, in Norfolk. But *carpinifolius*, Blox., is common.

R. GRATUS, FOCKE. A very distinct variety of *R. villicaulis*; occurring here and there on Mousehold Heath.

R. "SCABER" was reported on p. 396 of this volume by the Rev. F. W. Galpin, who showed it me in Gawdy Hall Wood, near Harleston. Shortly after I had so named it, I became aware of the new classification of the *scaber* forms. This Bramble from Harleston is the commoner of the three, and is now known as *R. Babingtonii*, Salt.

R. ECHINATUS, LINDL. Copses and heathy ground in Sprowston. This is the recognised name for what formerly passed as *R. rudis*, and was announced under that name by me on p. 142 of this volume. I have, however, the satisfaction of being able to put on record as well, the genuine

R. RUDIS, WEIHE. This I gathered in 1884, and was led by Mr. Archer Briggs to believe it was an unnamed intermediate between "*rudis*" (*i.e. echinatus*, Lindl.) and *Radula*. Happily I submitted it to Professor Babington lately, and he recognized it as the rare *R. rudis*, Weihe, only hitherto found for Britain on a Surrey heath.

R. NEWBOULDII, BAB. Sprowston and Mousehold Heath. This is the name Professor Babington now prefers for what has been known as *R. Purchasii*, Bloxam.

R. GELERTII, FRIDERICHSEN. Beeston St. Andrew, and damp copse, Sprowston. This was originally named for me by Dr. W. O. Focke. It had puzzled me for two years, as being unlike any British form. Professor Babington found that it

agreed exactly with specimens he had from K. Friderichsen. This is not known elsewhere for Britain.

R. LINTONI, FOCKE. This is a new Bramble, which I described in the 'Journal of Botany' (vol. xxv. p. 82), and named at first *R. lucens*, and afterwards *R. lætus*. Heathy ground, Sprowston.

R. TERETICAULIS, P. J. MÜLL. Abundant in a damp copse in Sprowston. This is another that is now reported for the first time (see current Report of the Watson Botanical Exchange Club). It is related to *R. Bellardi*, under which I had placed it. I have not seen it reported from any other part of Britain.

R. SCABROSUS, P. J. MÜLL. Beeston St. Andrew and Sprowston. This is what was known as *R. tuberculatus*, and under that name it has been reported for West Norfolk.

R. CÆSIUS, L., var. TENUIS. Dry copse, Sprowston. The species has of course been recorded before, but not the variety, I believe.

XIII.

SOME RECENT ADDITIONS TO THE NORFOLK AND NORWICH MUSEUM.

By Thomas Southwell, F.Z.S.

Read 27th March, 1888.

In all provincial museums a marked feature should be collections illustrating the local productions of the district which they represent, and I think it will be found that this principle has always been foremost in the minds of those who have had the direction of the affairs of the Norfolk and Norwich Museum. From its foundation in 1824, under the presidency of Sir J. E. Smith, a line of presidents equally distinguished—amongst whom may be mentioned Mr. Dawson Turner, the Rev. W. Kirby, Professor Sedgwick, Bishop Stanley, Thomas Brightwell, and lastly J. H. Gurney—have had the direction of its affairs, and their eminence in various

branches of natural science has insured that no department should be neglected; whilst in its honorary secretaries the institution has been equally favoured, as the names of Griffin, St. Quintin, and Stevenson will amply testify. It will be found, therefore, that whilst the general collection of Raptorial birds—the peculiar care of its present distinguished President—is especially excellent, the Zoology, Entomology, Geology, and Botany of a district peculiarly rich in each of these departments are all illustrated in the local collections with exceptional completeness.

It is not my purpose to refer, except *en passant*, to the Lombe collection of British birds, to the rich collections of Crag and Chalk fossils, and above all the grand Forest-bed series presented by Mr. John Gunn, who is happily still alive to add from time to time to his noble gift; to the Oological collection, contributed by J. D. Salmon and others; and a particularly rich Herbarium, also presented by Mr. Salmon; nor to the many local Ornithological rarities which have found a home in the County Museum. But as our Honorary Secretary has suggested that it would be desirable to record from time to time some of the most interesting specimens which gravitate towards this most fitting centre, I shall be pleased, with the help of Mr. Stevenson, to comply with his request.

Not to go too far into the past, the writer has a vivid recollection of leaving Martham Station, on the Eastern and Midlands Railway, one cold, wet morning in September, 1885, for a dreary drive to Horsey Hall, where the well-known local collection of birds made by the late Mr. Robert Rising was that morning to be disposed of by auction. Notwithstanding the dreary weather, and the inaccessible corner of the county in which Horsey is situated, the attendance at the sale was large, and events soon proved that those present were eager buyers. The birds all being in excellent condition, and well authenticated, sold for very high prices indeed.

At the close of the day, however, through the liberality of Mr. J. J. Colman, Mr. S. G. Buxton, Mr. G. F. Buxton, and the late Mr. John Gurney, the Norwich Museum was possessed of a Black Stork, a Brown Snipe, a Red-crested Whistling Duck, and a Buffel-headed Duck, all killed in the county of Norfolk, and which formed welcome additions to the rich collection of local birds already in that institution. Through the kindness of Mr. H. Birkbeck a specimen of *Porphyrio smaragnotus*, killed near Barton

Broad, was in the same year added to the collection. Whether this species be a genuine straggler, or only an escape, as to which opinions differ, it has occurred in Norfolk four times in an apparently wild state, and was a welcome addition.

To the collection of Raptores more than one hundred specimens were added in the year 1885, through the watchfulness of the President and his friends. A very interesting addition to the Botanical collection was made by Sir James Paget, being the collection of dried British plants and Algæ formed fifty years ago by Sir James and his brother (since dead) and used by them in compiling their 'Sketch of the Natural History of Great Yarmouth and its neighbourhood' in 1834. The collection of British Marine Shells was also enriched by some fifty-seven species through the liberality of W. J. O. Holmes, Esq., F.L.S.

During the year 1886 the Raptorial collection received an addition of two hundred and twenty-two specimens, including one hundred and twenty-six species from the President, two of which were new to the collection, viz., *Buteo alleni* from Florida, and *Urospizia jardinei*—type specimen. Many of these, as well as twenty-eight specimens presented by Lord Lilford, came from the collection of the late Sir William Jardine. Other valuable specimens of birds of prey were received from S. B. Doig, Esq., of Ahmedabad, North-west India; F. Ringer, Esq., of Nagasaki; W. Davison, Esq., Ootakamund, India; Turin Museum; Canon Tristram, and P. L. Sclater, Esq. Considerable additions were also made to the collection of Eggs. From Greenland, through the kindness of Captain David Gray, I was able to obtain skulls of *Ursus maritimus*, *Phoca groenlandica*, and *Phoca hispida*; and by exchange with the Cambridge Anatomical Museum, a skull of *Phoca vitulina*. A most interesting donation was made by Colonel Haggard of the Egyptian army, consisting of the Mummy of a Priestess, from Ekhmin, Upper Egypt, brought over by the donor.

The year 1887 has again been noted for the valuable additions made to the collection of local birds. Change of residence rendered it necessary for Mr. Stevenson to dispose of the bulk of his choice and well-known collection of Norfolk birds, and I was commissioned to secure for the Museum, and thus preserve for the county, many local specimens of great interest. The most important of these,

mounted in cases or under glass shades, comprise an adult Crane, shot at East Wretham; Black-tail Godwits, summer and autumn plumage, Norfolk; ten Ruffs, in full summer plumage, Buckenham marshes; Pallas's Sand Grouse, two males and one female, Norfolk, 1863; Sabine's Gull, Breydon, October, 1881, one of the only two killed in the county; Squacco Heron, adult, Surlingham, 1863; Baillon's Crake, near King's Lynn, 1874; adult Rough-legged Buzzard, Thetford Warren; Pectoral Sandpiper, Caister, near Yarmouth, 1865; and a Broad-billed Sandpiper, Breydon, 1868. Also a pure white Blackbird, killed in the county, to which Mr. T. Roberts recently added a companion in a pure white Starling, shot on Mousehold, September, 1887. The thanks of the Museum subscribers are specially due to the following liberal donors—viz., the Right Hon. Lord Lilford, Sir T. Fowell Buxton, J. H. Gurney, Esq., J. H. Gurney, Esq., Jun., S. G. Buxton, Esq., Geoffrey F. Buxton, Esq., J. J. Colman, Esq., M.P., Samuel Hoare, Esq., M.P., Henry Birkbeck, Esq., and J. G. Barclay, Esq., who have enabled the institution to become possessed of these interesting and valuable specimens.

As usual large additions were made by the President and others to the collection of Birds of Prey, Mr. Gurney alone contributing one hundred and twenty-six specimens, which included four species new to the collection. Speaking of these at the annual meeting, Mr. Gurney remarked that: "The more perfect the collection became, the more difficult it was to fill up the gaps that remained. One was a specimen of the largest Owl known, *Pseudoptynx blakistoni*, from Yesso, Japan. It was named after Captain Blakiston, its discoverer. Ever since the period that it was discovered he had been trying to get a specimen. In the latter part of 1886 a pair were sent alive to the Zoological Gardens, and he begged the authorities there to send a specimen to the Norfolk and Norwich Museum in the event of any misfortune happening to the birds. It happened that the male bird died, and it was sent down to the Museum. On Tuesday he had a letter from a warm friend of the Museum, Mr. F. Ringer, of Nagasaki, who promised to endeavour to obtain for them a female in the wild state. This Owl belonged to a peculiar group of three species. Of the two other species they had specimens, and the group was complete. The New Guinea Hawk, *Urospizias melanochlamys*, referred to was a very

rare species. The West Australian Owl, *Spiloglaux ocellata*, was obtained from the authorities of the British Museum, who exchanged it for some birds in his own collection. The fourth species was *Scops elegans*, from the Loo Choo Islands."

The collection of Eggs again received some valuable additions from Professor Newton and Mr. Gurney, and a number of Sterna of British birds, and a nest of the Hawfinch, taken at Weston, Norfolk, were presented by the Honorary Secretary, Mr. Stevenson.

To the Geological collection a most extensive and valuable donation has been made by Alfred F. Buxton, Esq., being a cabinet containing 2590 geological specimens, including 865 species, ranging from the Silurian to the Norwich Crag formation, collected by his brother the late Rev. F. A. Buxton. To this has since been added, by the same donor, a glazed wall case, for fossils, 6 feet 6 inches high, 18 inches deep, and 10 feet long. The subscribers are also indebted to Colonel Feilden for a very interesting collection of Palæolithic and Neolithic implements of different types found in this county.

In the death of the late Mr. John Gurney the Museum has lost one of its most liberal supporters, and one to whom an appeal in aid of its funds was never made in vain; his last offer being the munificent gift of £5000 towards the expense of converting the Norwich Castle, which had recently become the property of the Corporation, into a receptacle for the valuable collections contained in the Museum.

XIV.

METEOROLOGICAL NOTES, 1887.

By Arthur W. Preston, F. R. Met. Soc.

Read 28th February, 1888.

January.

The severe winter weather which had prevailed throughout the greater part of the preceding month continued with no intermission whatever until January 19th, when a somewhat more genial temperature was experienced by day, but with frosts nearly every night. The mean temperature of the month (33.9 degrees) was 3½ degrees below the average, that of the first eighteen days (30.2 degrees) being as much as 7 degrees below. There were frequent falls of snow, and all the first half of the month the ground was frost-bound. Frosts occurred on twenty-five nights, and good skating was indulged in for many days together. It was the most winterly month since the very exceptional January of 1881.

February.

This month was fairly seasonable, giving many bright days with cold nights. The first and last weeks were warm, but the middle of the month was exceptionally cold, the thermometer falling to 17.8 degrees on the 17th. The barometer rose to a great height in the second week, and this high pressure was accompanied by a period of easterly winds of considerable force, lasting from the 6th to the 16th. The most remarkable features of the month were, however, the great dryness, and the extraordinary high state of the

barometer. Only 0.64 of rain fell, and but one shower of snow; and, with the exception of one day, the barometer remained above thirty inches from the 3rd to the 28th.

March.

This month entered with very foggy weather, giving place on the 11th day to a very winterly period lasting to the 22nd, even more severe than that of the previous March. On the 13th the thermometer fell to 19.4 degrees (a point but rarely recorded in March), and to 21.6 degrees the following day. Frequent snowstorms occurred, and for ten days the ground was covered with snow. The last week of the month was somewhat milder, with rain at times, and accompanied by rough north-westerly winds. The mean temperature of the month (37.8 degrees) was as much as 4½ degrees below the average. During the last fifty years so cold a March has only occurred three times, viz., in 1845, 1865, and 1883.

April.

April entered with a severe snowstorm, and was throughout one of the most ungenial and unpleasant spring months ever known. Although April, 1879, was nearly as cold, we have to go back as far as 1837 for an April with a lower mean temperature. Vegetation remained at a standstill almost throughout the month, night frosts being frequent, and snow showers occurring at times even to the 27th. On the 17th the thermometer fell to 25 degrees, a temperature in some years not recorded throughout the winter. Bitter north-east winds prevailed without any intermission throughout the second and third weeks, at times reaching the force of a gale, and for many days together the sky was completely obscured by heavy dark clouds.

May.

With the advent of May it was hoped that the cold of the preceding months would be compensated for by some genial weather; but such hopes were doomed to disappointment; for with the exception of the 8th, 9th, and 31st, the thermometer did not reach 60 degrees throughout the month, the wind blew from the east and north-east on eighteen days, and the mean temperature of the

month was 5 degrees below the average. The month ranks as one of the five coldest Mays of the present century, those of 1817, 1837, 1855, and 1879, being of a similar mean temperature. A disastrous gale from the west-south-west prevailed on the 20th, accompanied by heavy rain, which day was more in character with November than May, as indeed were many during the month. Vegetation was extremely backward, in fact, it is stated that there has been no spring like it since 1837. At the end of the month many trees were as bare as in the depth of winter, the hawthorn had hardly begun to flower, and on "Oak Apple Day" (May 29th) there was scarcely a leaf on the oak trees.

June.

The "Jubilee month" brought "Queen's weather," for a more delightful June had not been experienced for ten years past than that under review. After the six months continued cold ungenial weather the change was the more welcome, and by the middle of the month all nature was clothed with the richest verdure. The most remarkable feature of the month was the extraordinary drought which prevailed, rain falling on three days only (viz., the 1st, 2nd, and 8th) to the depth of 0.18 in. A maximum temperature of 82.8 degrees was recorded on the 15th, and on twelve other days the thermometer exceeded 70 degrees. The warm weather was, however, interspersed with some cool northerly winds about the 24th, causing a considerable fall in the temperature. Owing to a severe attack of illness the writer was obliged to discontinue his instrumental observations between June 17th and the middle of July, and is much indebted to Mr. J. T. Hotblack, F. R. Met. Soc., for his kindness in assisting him to supply the blanks in his register.

July.

This was a fine hot summer month, and the warmest for three years past. The drought which commenced on June 9th broke up on July 4th (being an absolute drought of twenty-six days), but the rainfall of the month was but trifling, and nearly an inch and a half below the average. Thunderstorms occurred on the 9th, 14th, and 16th, but the rest of the month was remarkable for the unusual amount of sunshine even for the height of summer, the

percentage of possible duration being 57, against 49 in 1885 and 1886. The mean of the day temperatures was 75.1 degrees, but the nights were occasionally somewhat cool for the season, thereby reducing the mean of the month. Wheat cutting became general in Norfolk about the 31st.

August.

This was also a fine summer month, though somewhat cool in the third week, and showery and stormy at the close. The rainfall of the year being at this time 4½ in. deficient, these showers were by no means unwelcome. There were no very special features of note; and harvest proceeded with but little interruption, being completed in most parts of the county by the end of the month.

September.

September was unusually cold and cloudy, the mean temperature being 4 degrees below the average. It was the most cloudy month since November, 1885. The rainfall was about the average, but the percentage of humidity high for the season. The rain fell principally in the first, second, and fourth weeks. The third week was dry and gloomy with very high barometer. The thermometer fell to 33.8 on the morning of the 29th, an unusually low reading for September.

October.

This was another month of exceptionally cold and dull weather. The mean temperature was 4 degrees under the average, and the month will rank as one of the coldest Octobers of the present century. The highest reading of the thermometer for the month (58.6 degrees) was an unusually low maximum for October, and is almost without precedent. In the previous October the temperature exceeded 60 degrees on fifteen days, and 70 degrees on three days; and the month's mean was more than 7 degrees higher than in October, 1887. Although the thermometer did not fall below 30 degrees in the screen, and frosts were only recorded on four nights, there were many ground frosts of a severity unusual so early in the season. The rainfall was but little in excess of the average, but the fall of snow on the 12th

was very remarkable, as fifty-eight years have elapsed since so early a fall has been recorded in the eastern counties. A very sudden depression of the barometer occurred on the morning of the 30th, when it fell from 29.62 in. on the night of the 29th to 29.11 in. by 8 a.m. on the following morning. The recovery of pressure was so rapid that 29.60 in. was again reached by the afternoon of the same day. The depression was accompanied by a short but violent storm of wind and rain.

November.

The mean temperature of this month was about 2 degrees below the average, and 4 degrees lower than that of the previous November. Some sharp frosts occurred in the third week, the low minimum of 22.8 degrees being recorded on the morning of the 17th. Snow fell on the 14th and 15th, and remained on the ground until the 21st. Fogs of unusual density also occurred at times, and the month was the coldest November since 1879.

December.

This was on the whole a winterly month, but not so cold as the previous December. Like the four previous months the mean temperature was below the average, and frosts occurred on eighteen nights. Snow fell on ten days, but the falls were by no means heavy. The mean temperature of the last fortnight was 32.2 degrees (about 6 degrees below the average), and the weather during the Christmas holidays was as seasonable as could be desired. The ground was covered with snow from the 19th to the end of the year. The prevailing winds were from the west and north-west, and depressions of the barometer on the 9th and 15th were attended with gales from the south-west and west.

Year.

Speaking generally, the weather may be said to have been very cold, dry, and ungenial until the end of May, the winter having been the most severe and protracted for many years, and the spring one of the coldest on record. June was remarkable for the very severe drought that prevailed throughout the month, and July for the extreme heat and somewhat cold nights for the season. August

was also very warm by day, but showery in the latter part, while from September 1st to the end of the year there was but little mild weather, the temperature being persistently below the average, and an unusual amount of cloud and vapour almost constantly prevailing. The temperature of each month, with the exception of June and July, was below the mean, and in several months, particularly March, May, and October, considerably below. This is the more remarkable from the fact that in 1886 the temperature of nine months, and in 1885 that of ten months, was also below the average. The following table will illustrate the comparative temperature of the different months in the five years 1883 to 1887 inclusive, also the approximate average of twenty years.

	1883.	1884.	1885.	1886.	1887.	Av. of 20 years.
	Degrees.	Degrees.	Degrees.	Degrees.	Degrees.	Degrees.
January	39 3	41.8	35.2	35.3	33.9	37.5
February.....	42.0	40.9	41.7	34.0	38.8	40.0
March	35.4	44.6	39.7	40.3	37.8	42.0
April	47.7	45.8	48.5	46.6	43.8	47.5
May.....	54.3	55.0	49.9	52.7	48.4	53.0
June	59.0	58.6	58.7	55.7	59.3	59.0
July	60.5	65.1	62.0	61.3	64.5	63.9
August	62.3	66.1	58.2	61.5	60 4	62.0
September ...	58.2	59.4	55.2	58.9	54.2	57.5
October	51.1	48.5	45.2	53.0	45.9	50.0
November ...	42.9	42.2	41.4	44.1	40.7	43.0
December ...	38.6	39.6	38.2	34.9	36.0	38.5
Year.	49.3	50.6	47.8	48.2	47.0	49.4

Taking the temperature of the four seasons in their order, we obtain the following results :—

Seasons.	1887.	Av. of 20 years.	Departure from average.
	Degrees.	Degrees.	Degrees.
Winter (December to February).....	35.8	38.7	— 2.9
Spring (March to May)	43.3	47.5	— 4.2
Summer (June to August)	61.4	61.3	+ 0.1
Autumn (September to November) ...	46.9	50.0	— 3.1

The rainfall of the year was 6.68 in. below the average for Norwich for the twenty years 1865 to 1884. The total was nearly the same as that of 1884 ; but in the last-mentioned year the dry weather was accompanied with much warmth.

For the sake of comparison, the following returns show the monthly falls at Norwich in the five years 1883 to 1887 inclusive, the average of the twenty years ending 1884, and the departure of the monthly falls of 1887 from such average.

Months.	1883.	1884.	1885.	1886.	1887.	Av. of 20 yrs.	Departure of 1887 from av.
	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
January	2.30	1.34	2.25	2.64	1.77	1.85	— 0.08
February	2.63	0.62	2.20	0.39	0.64	2.00	— 1.36
March	2.31	1.30	1.40	1.39	1.67	1.75	— 0.08
April	1.77	1.69	1.51	1.41	1.22	1.80	— 0.58
May	1.19	0.70	3.04	2.55	2.25	1.60	+ 0.65
June	2.88	0.52	0.92	0.50	0.48	2.00	— 1.52
July	2.39	2.64	0.86	4.01	1.22	2.70	— 1.48
August	0.77	1.26	0.78	2.19	2.34	2.40	— 0.06
September	3.08	3.08	4.50	1.32	2.76	2.85	+ 0.09
October	3.53	3.22	6.77	2.30	2.94	2.80	+ 0.14
November	3.37	2.03	3.22	2.61	1.98	2.85	— 0.37
December	2.25	2.48	1.15	3.42	1.25	2.60	— 1.35
Year.	28.46	20.88	28.60	25.23	20.52	27.20	— 6.68

Snow is included in the above measurements, and fell on six days in January, one in February, fourteen in March, three in April, three in October, two in November, and ten in December.

Annexed is the general table of results, similar to that appended to previous papers, and which shows in a concise form the main meteorological conditions of 1887.

1887.

Month.	Barometer.					Thermometer.					Hygrometer.	Cloud.	Rainfall.				Wind.								
													Thorpe Hamlet.		Heigham.		Direction.								
	Highest.	Date.	Lowest.	Date.	Mean.	Highest.	Date.	Lowest.	Date.	Mean.	Relative Humidity, 9 a.m.	Estimated proportion 0—10.	Inches.	No. of days.	Inches.	No. of days.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	Mean estimated force
						°		°		°															
Jan. .	30.61	21	28.79	5	30.00	53.0	28	19.6	2	33.9	93	6.4	1.77	14	1.75	14	2	1	3	3	11	3	6	2	2.8
Feb. .	30.79	8	29.69	2	30.34	55.0	5 & 28	17.8	17	38.8	88	5.0	0.64	6	0.62	7	3	3	7	1	3	8	2	1	3.3
March	30.63	2	29.43	22	30.07	57.0	27	19.4	13	37.8	85	5.9	1.67	14	1.91	15	1	7	5	1	1	3	8	5	3.0
April	30.67	17	29.38	24	30.01	65.0	19	25.0	17	43.8	76	5.7	1.22	14	1.19	15	4	10	1	1	3	3	4	4	3.6
May .	30.40	8 & 14	29.22	20	30.03	67.4	8	31.6	1	48.4	79	7.0	2.25	17	2.17	16	6	9	3	0	0	3	2	8	2.7
June .	30.52	10	29.64	3	30.22	82.8	15	42.2	11	59.3	72	4.9	0.48	3	0.41	3	5	7	4	0	0	1	9	4	3.2
July .	30.43	1	29.76	10	30.08	86.8	3	43.0	19	64.5	65	5.0	1.22	12	1.19	13	3	3	2	1	2	8	8	4	2.7
Aug. .	30.39	3	29.48	31	30.04	85.6	6	41.0	15	60.4	70	5.8	2.34	14	2.27	14	3	4	3	3	2	7	2	7	3.0
Sept. .	30.55	24	29.32	2	29.97	68.2	3	33.8	29	54.2	80	7.3	2.76	20	2.56	20	6	3	0	0	0	9	5	7	2.8
Oct. .	30.68	22	29.11	30	30.13	58.6	1	30.0	26	45.9	88	6.5	2.94	21	2.81	18	9	1	0	0	0	2	9	10	2.8
Nov. .	30.43	16	28.98	3	29.79	54.8	6	22.8	17	40.7	91	6.7	1.98	21	2.11	21	3	9	1	2	5	4	3	3	2.8
Dec.	30.38	2	29.20	8	29.77	52.8	8	22.6	13	36.0	92	6.4	1.25	20	1.35	21	2	3	0	0	4	4	9	9	3.1
Means					30.03					47.0	81.5	6.0													3.0
Extremes & Totals	30.79	Feb. 8th	28.79	Jan. 5th		86.8	July 3rd	17.8	Feb. 17th				20.52	176	20.34	177	47	60	29	12	31	55	67	64	

XV.

BOTANICAL NOTES, 1887.

The Rev. E. F. Linton reports Spergularia marginata and S. neglecta as both growing at Cley. These will be new records for the Society's "nc." district, and in the case of *S. marginata* for Mr. H. C. Watson's "e." vice county. Also Salicornia herbacea, var. procumbens, Sm., from the same place. This is new to the "nc." division. [I found this at Wells on the occasion of the Society's excursion.—H. D. G.]

Dr. Long reports additional plants from Wells and its neighbourhood during the year.

Linum angustifolium, Huds. Stiffkey.

Gnaphalium uliginosum, L. An odd form of this plant growing on poor cultivated soil, two to six inches high, heads of flowers on subsessile lateral branches, Burnham Overy.

Erythræa pulchella, Fries. Wells. [I have received this plant two years running, 1886–7, from Mr. C. G. Barrett, from between Holme and Hunstanton.—H. D. G.]

Verbascum lychnitis, L. Waste ground, Wells.

Mentha alopecuroides, Hull. And what appears to be M. gracilis, Sm., are the two forms of garden Mints in this district.

Calamintha nepeta, Clairv. Stiffkey.

Chenopodium murale, Lin., and C. rubrum, Lin. Both at the Watch-house on the Wells Marshes.

Juncus gerardi, Lois. A small dwarf form, one to three inches high, sandy turf, Holkham. [I think this very curious little plant will require further investigation from more perfect specimens. I have never seen anything like it before.—H. D. G.]

JUNCUS LAMPROCARPUS × ACUTIFLORUS, BUCHENAU. So named by Mr. Beeby and Mr. Arthur Bennett. A curious hybrid, very luxuriant, large panicles; some specimens viviparous, quite seedless. Stiffkey.

A *Festuca* from formerly cultivated soil in Holkham Park has been named by Professor Hackel, to whom specimens were sent by Mr. Arthur Bennett., together with the next variety, FESTUCA OVINA, var. DURIUSCULA, sub. var. BRACHYPHYLLA.

A *Festuca* growing in the salt marshes which has always seemed a distinct variety resembling the *F. arenaria* of the sandhills, but with more or less flaccid leaves and a less creeping root, has been named by the same authority FESTUCA RUBRA, L., *β.* GRANDIFLORA forma LITTORALIS.

GENUS STATICE. The forms found growing on the Norfolk coast appear to be as follows:

S. limonium, Linn.

(a) *genuina*, Syme.

(b) *pyramidalis*, Syme.

The variety (b) flowers earlier than (a), and is in fact going off flower when (a) begins to expand.

S. auriculæfolia, Vahl.

(a) *occidentalis*, Lloyd.

This varies a good deal, but does not appear on our coast to become the "*intermedia*" of Syme.

S. reticulata, Sm.

All of these forms grow plentifully at Wells. I have never seen any specimen of *S. rariflora*, Drejer, which according to Student's Flora (third edition), is the same as *S. bahusiensis*, Fries, from the Norfolk coast. The Rev. E. K. Kerslake was kind enough to send me the form which he had known under the latter name, but it is quite different from authentic *S. rariflora* from the Isle of Wight; in fact, it differs from *S. limonium*, in being more compact, whereas *rariflora* is a lax form with the flowers more distant, as is well shown in E. B. 3rd ed., t. 1158.

GENUS ERYTHRÆA. At Wells we have four forms of *Erythræa*, three of which are referable to *E. centaurium*. The first of these is the ordinary form, common throughout the county; the second a narrow-leaved form simulating *E. littoralis*, but without any

radical clusters of leaves characteristic of that sub-species; the third a broad ovate-leaved form simulating *E. latifolia* in general appearance, but with a long corolla tube; the fourth form is the sub-species *E. pulchella*, which grows larger here than I have ever seen it elsewhere. One specimen gathered on the 27th July, 1887, is ten inches in height.

JUNCUS NIGRITELLUS, Auct. Ang. (non Don). Of this Rush I have a very fine series sent at different times by Dr. Long, as well as specimens of my own collecting at Wells in July last. Between *some* of these and specimens from Harlech collected by Mr. C. Bailey, F.L.S., and also from the Scilly Isles, I can find no difference at all, and all of them appear to be simply a maritime variety of *J. lamprocarpus*. Of *J. nigritellus*, D. Don, there are three good specimens in the Salmon Herbarium in the Norfolk and Norwich Museum, collected by Gr. Chambers at End Side Tarn, West Cumberland. Two of these might have been used as the models for part of Don's own plate in the E. B. S. (No. 2643); and the third I think would have been named *Juncus alpinus*, Vill, without much hesitation, had it been found on the continent instead of in England. As these three specimens were no doubt gathered at the same time and place, we have here a confirmation of the opinion which has been expressed by Mr. Beeby, A.L.S., that Don's plant is a variety of *J. alpinus*; and this opinion recalls that expressed by La Harpe long ago, and alluded to by D. Don in his article in E. B. S., that it is a variety of *J. ustulatus*, Hoppe. However this question may be ultimately settled, I think that both the habit of growth and the shape of the capsules is too different in the plants from Wells and from End Side Tarn to regard them both as the same variety of any one species.

GENUS AGROPYRON. I find at Cley and Wells four maritime forms of this genus, which I believe to be

A. PUNGENS, R. and S.

„ „ var. b. LITTORALE (REICH).

„ ACUTUM.

„ JUNCEUM, BEAUV.

The first is a compact upright, almost bristly, plant, which is very abundant at Cley; the second is lax, the stems partially decumbent at the base, the plumes acuminate, or almost awned;

the third has the habit of *A. repens*, with inflorescence approaching that of the fourth, the well-known and unmistakable *A. junceum*.—H. D. G.

The Rev. F. W. Galpin in his excellent Flora of Harleston and its neighbourhood publishes two species new to the Society's county records, PRIMULA ELATIOR, JACQUIN, and ASPLENIUM VIRIDE, HUDSON. The former of these, the true Oxlip, is found on Dickleburgh Moor, and is therefore in our "sc." division. The latter has been known to grow on an ordinary brick wall, near Bungay, but in the county of Norfolk, for nearly forty years. The exact locality is suppressed for obvious reasons. It is in the "e." division of the county.

EXCURSION TO WELLS, JULY 27TH, 1887.

The following list of plants observed on the occasion of the Society's excursion may be interesting. Several Chenopodiaceæ did not arrive at home in sufficiently good condition to be accurately worked out.

DIPLOLAXIS MURALIS
LEPIDIUM RUDERALE
FRANKENIA LŒVIS
SILENE MARITIMA
ARENARIA PEPLOIDES
MEDICAGO LUPULINA
TRIFOLIUM ARVENSE
,, STRIATUM
,, HYBRIDUM
,, FRAGIFERUM
VICIA HIRSUTA
,, ANGUSTIFOLIA (SEGETALIS)
EPILOBIUM PALUSTRE
HYDROCOTYLE VULGARIS (full of flower)
APIUM GRAVEOLENS
PEUCEDANUM SATIVUM
EUPATORIUM CANNABINUM
ASTER TRIFOLIUM
ERIGERON ACRE
FILAGO MINIMA
SONCHUS ARVENSIS, C. ANGUSTIFOLIUS, MEY.

STATICE LIMONIUM
(a) GENUINA
(b) PYRAMIDALIS
S. AURICULÆFOLIA
(a) OCCIDENTALIS
S. RETICULATA
GLAUX MARITIMA
ERYTHRÆA CENTAURIUM (three forms, see notes)
„ PULCHELLA
SOLANUM NIGRUM
HYOSCYAMUS NIGER
BARTSIA ODONTITES
BETA MARITIMA
ATRIPLEX PORTULACOIDES
SALICORNIA HERBACEA
„ HERBACEA VAR. PROCUMBENS
„ RADICANS
SUÆDA FRUTICOSA
„ MARITIMA
SALSOLA KALI
EPIPACTIS PALUSTRIS
JUNCUS GERARDI
„ NIGRITELLUS (Auct. Ang.)
SCIRPUS MARITIMUS, COMPACTUS
CAREX ARENARIA
„ VULPINA
„ DISTANS
„ EXTENSA
POLYPOGON MONSPELIENSIS
AMMOPHILA ARUNDINACEA
ARUNDO PHRAGMITES (with creeping stems 20 feet long)
AGROPYRON ACUTUM
„ JUNCEUM
ELYMUS ARENARIUS

H. D. GELDART.

XVI.

NOTE ON STONE IMPLEMENTS FOUND IN NORFOLK.

By Colonel H. W. Feilden, F.G.S.

Read 27th October, 1887.

It is with considerable diffidence that I offer to trespass on the time of the meeting this evening, but with your permission I will make a few remarks on a subject which I do not think has hitherto been so fully recognised by our Society as, I venture to think, it might be.

Our county is especially rich in the implements used by the prehistoric races that once lived upon its soil. No systematic attempt has hitherto been made to collect these interesting objects for preservation in the Norwich Museum, where they would be available for the specialist and the public at large.

In some parts of the county one can scarcely examine a heap of stones collected from off the fields without finding amongst them some bearing evident marks of human workmanship. Year after year this clearing of the fields from stones goes on, and the heaps collected are used as road metal.

This process of clearing the land of surface flints must yearly lead to the destruction of a large number of stone implements. Very often fine specimens of stone axes, hammers, &c., are found by the labourers, and in some cases kept as curiosities, but more generally are thrown away.

I venture to suggest that it would be a good plan for our Society to draw up a short paper on Stone Implements, illustrated with a few typical forms, and have this tract distributed amongst the landowners and farmers of the county, with the request that future finds may be deposited in the Norwich Museum.

I am satisfied that if some plan of this kind were adopted it would produce very beneficial results, for I find that in the generality of instances the possessors of stone implements are quite willing to present them to some institution where they will be preserved and made available for the inspection of the public. I have a case in point to illustrate this. Here are four fine Celts which were found by a labourer named Matthew Humphrey in the year 1866. This man was employed in throwing up a dyke in a field in the parish of Little Walsingham, not far from Egmere farm-house, in the county of Norfolk. About two feet and a half below the surface he came upon these four Celts which he brought up in the same cast of the spade, from a soil which he described to me as a "sort of black gravel." Thinking them curious kind of stones he handed them to his employer, the late Mr. Robert Overman, tenant of Egmere.

Two of these Celts passed into the possession of Frederick Long, Esq., M.R.C.S., of Wells, Norfolk; the other two were retained by Miss Overman, who has most kindly placed them at my disposal to describe, and to hand over to the Norwich Museum.

The four polished Celts now exhibited belong to Class 3, as laid down by Dr. John Evans, F.R.S., in his work on the 'Ancient Stone Implements of Great Britain' (London, 1872), viz., "Those which are more or less ground or polished, not only at the edge, but over the whole surface."

Figure 43 of the same work gives a very accurate illustration of this form of Celt, which Dr. Evans considers a common form in the Eastern Counties, though not by any means confined to the East Anglian counties. The particular interest connected with the Egmere find, seems to me to lie in the fact that all four Celts belong to the same type, which is the typical one among the polished Celts of East Anglia, and that they were found together under circumstances which lead us to believe that they were an original interment deposited by the prehistoric people who fashioned them and used them.

The dimensions of the four Celts are:—

7½ inches long, 3¼ inches wide, and 1¼ inches thick.
7 inches long, 3½ inches wide, and 1½ inches thick.
6 inches long, 3⅜ inches wide, and 1⅛ inches thick.
5¾ inches long, 3¼ inches wide. and 1¼ inches thick.

In addition to the "Egmere find" I have laid on the table this evening, prior to their deposition in the Museum, twenty-four Palæolithic Celts from the undisturbed river gravels of Warren Hill, Mildenhall, where these gravel-beds are largely worked for road ballast—these Warren Hill gravel pits have not been worked during the period that I have had opportunities of visiting that part of the county—three Palæolithic Celts (rather indifferent specimens) from Wilton, near Brandon; also a few portions of implements that I have picked up around Grimes Graves in the parish of Weeting, Norfolk.

XVII.

MISCELLANEOUS NOTES AND OBSERVATIONS.

Tenacity of Life in young House Martins. In my Ornithological Notes for 1880, I referred to an account by Mr. Southwell in the 'Zoologist' for that year (p. 401), of some young House Martins having been thrown down by bricklayers, with their nest, from the eaves of a house near Unthank's Road, and that these were subsequently swept up with the rubbish, and thrown into a bin on the premises of Mr. F. Kitton. This occurred on the 1st of July, when the nest contained three young ones and one egg. These fledgelings remained in the bin till the morning of the 4th, when Mr. Kitton's children, hearing the birds chirping, took them out, and fed them on soaked bread, which they eat readily; but they died on the following morning. Mr. Kitton estimated that these young birds, from the time of their violent expulsion from the nest, had been deprived of the warmth of the nest, and of the parent birds as well, and of food, for sixty-two hours, and that up to the time of their death a period of eighty-six hours intervened. That such purely insect-eating birds, so incessantly fed by their parents, should have survived so long, and under such circumstances, seemed almost incredible except on the best authority. I am now, however, able

to record a somewhat similar instance which occurred some years ago at Ixworth in Suffolk.

A lady friend who is now residing on Unthank's Road, but has been, when resident in the country, a most successful rearer of young birds which, from the best of motives, have come under her fostering care,—to save them from cats, in exposed places, or bird-nesting boys,—tells me that, near where she then resided, House Martins built under the roof of a water-mill. A carpenter employed on the premises, one *Monday* morning, pulled down a nest with young ones, four or five, and these nestlings he carried home at dinner-time, for his children to play with. Mrs. Ray happened to call at the cottage late on the following *Thursday* afternoon, and saw the birds, which, she was informed, had had nothing to eat all that time, but the children had played with them, and put them in a little basket at night.

She took them all home with her, and fed them on finely-shredded meat and scalded bread. They were dull and languid at first, but soon revived, and became, as she expresses it, most engaging pets, "bright, cheery, and chatty." They were some time before they left the nest she provided for them, but they all lived, and eventually took flight, and, most probably, as she supposes, rejoined their parents at the mill, about half a mile away. Mrs. Ray had frequently told this story to her friends, who, to her mortification, were usually sceptical as to the facts: but I had the pleasure of showing her the account of Mr. Kitton's House Martins, in our Transactions, which goes far to corroborate her story.—H. Stevenson.

Great Bustard. I have lately come into possession of a Bustard (*Otis tarda*) and from what I can gather of its history, I am inclined to believe that it is a Norfolk bird of the aboriginal race. I am indebted to Mr. William Wiley, of Peterstone, Holkham, for the specimen, and the following is what I can gather with regard to it. More than twenty years ago, the wife of a James Pegg gave this bustard (uncased) to Mr. Wiley's children as a plaything. James Pegg was at that time working at the Peterstone brick-fields (the property of the Earl of Leicester), and Mr. Wiley was then, as now, overseer of those works. Mr. Wiley assures me that the Bustard did not originally belong to James Pegg, nor to his

family, who were residents on the Holkham estate, but was undoubtedly brought to this neighbourhood by James Pegg's wife. The bird was used as a plaything by Wiley's children, both indoors and in the garden, for some time; when on one occasion it fortunately attracted the attention of the late Mr. Samuel Bone, who for many years was deer-keeper at Holkham Park. As Mr. Bone had been brought up on Mr. Hamond's estate of Westacre, when Bustards existed in that neighbourhood, he at once recognized the value of the specimen, and protested against the treatment it was receiving at the hands of Wiley's children, and induced Wiley to have the bird cased.*

Both James Pegg and his wife, the donor of the Bustard to Mr. Wiley's children, are dead; but learning that one of their children was living with a relative in Burnham Market, I made enquiries, and elicited that Mrs. James Pegg's maiden name was Marianne Coe, and that she was the daughter of a labouring man in the parish of Sedgeford, in the county of Norfolk. How this Bustard came into the possession of the late Marianne Coe (or Pegg) will in all probability not now be found out; but as her relations were inhabitants of Sedgeford, near Heacham, on the borders, if not actually within the "Swaffham tract" occupied by the "Bustard drove" in the first quarter of this century, it seems to me more reasonable to suppose that this specimen belonged to our native race, than that it was a migratory example. That the specimen is a Norfolk killed one appears to me unquestionable, otherwise it would be difficult to account for its having been in the possession of persons belonging to the labouring class, and natives of the county. The inartistic mounting of the specimen suggests the presumption that it was the work of the village birdstuffer.—H. W. Feilden, March 20th, 1888.

Migrants at Lowestoft, October, 1887. On the 16th there was a large immigration of Crows here. I observed them first about ten o'clock, and parties continued to arrive all day in numbers from twenty to two hundred, at intervals not exceeding a quarter of an hour till dark. Many thousands therefore must have

* I may add as a note, not without interest, that in 1880, Mr. Bone, then sixty-nine years old, told me he had as a youth when employed in the fields at Westacre found a Bustard's nest with two eggs in it.

passed into the country. So far as I could judge Rooks were by far the commoner, and in only two parties I distinctly made out Hooded Crows. On this day I noticed one large flock of perhaps a hundred Chaffinches arrive. On the 17th I saw a large flock of some two hundred starlings, a few Rooks, and some Titlarks. On the 20th one flock of Crows, but I could not say with certainty to what species they belonged. On the 21st and 22nd I saw small flocks of Rooks arrive. I cannot say whether this migration had been going on previously, as I arrived only on the evening of the 15th. I have been at Lowestoft the last three autumns, but I have never before observed so many Crows migrating. Rooks I believe were far the most numerous of all the Crows which arrived.—Edward Newton.

Hybrid Wagtails (*cf.* 'Zoologist,' 1885, p. 24). I have the pleasure to bring for exhibition this evening a hybrid Wagtail bred in confinement. From the difficulty of keeping Wagtails as cage-birds they are seldom to be seen in the aviaries of any but the most enthusiastic, and a Wagtail of any kind bred in confinement is almost unknown. The bird on the table was hatched and reared in Mr. T. J. Monk's large out-door aviary in Sussex, and is the produce of the hybrid progeny of two species,—the Pied Wagtail (*Motacilla lugubris*), and the Grey Wagtail (*M. melanope*). The first cross was between a cock Grey Wagtail and a hen Pied Wagtail, and the second cross between the male hybrid and a hen Pied Wagtail: two of the second cross were preserved, of which this is one. It might be passed over at first sight for an ordinary young Pied Wagtail, but the back is darker, and if put beside the Pied Wagtail skins, brought for comparison, it will at once be observed that the hybrid has no white at all on the wing-coverts.

That what has happened in confinement should occasionally happen in a state of nature is not very wonderful, and Mr. F. Bond has a Wagtail shot at Brighton which from the mixed colour of the crown of its head looks like a cross between the yellow species (*M. raii*) and the grey-headed (*M. flava*). I shot some similar Wagtails in North Africa, similar at least in respect of the mixed colour on the crown, which are very likely hybrids. Lord Walsingham recently sent to the British Museum a male Wagtail (in the flesh),

identified by Messrs. Saunders and Sharpe as a White Wagtail, which had paired with a female Pied Wagtail and produced a brood of hybrid young ones near Merton (Sharpe, 'Catalogue of Birds in British Museum', pp. 463, 468), thus proving, if their identification be correct, that allied Wagtails cross in a state of nature. Lord Lilford has been so good as to inform me that in the spring of 1887 a White and a Pied Wagtail paired in his garden at Bournemouth, and that both birds were constantly within a few yards of him, but he did not discover the nest. The two species are believed to have bred together in Cumberland (see Trans. Cumberland and Westmoreland Assoc. 1887, p. 34). It is not improbable that many instances of such a conjunction may have happened, and not been noticed owing to the similarity of the two.

If it be admitted, as seems highly probable, that hybridism frequently takes place in a state of nature, the variation in a number of anomalous birds which at one time and another have puzzled collectors by their plumage would be explained away. It is a known fact that hybrids frequently take so closely after one or other of their parents as to be indistinguishable from them; how impossible then it is for us to prove that such unions are not of frequent occurrence.—J. H. Gurney, Jun.

Hybrid Sparrow (between *Passer montanus* and *P. domesticus*). The hybrid Sparrow bred by Mr. R. Otty of Orford Hill, alluded to at p. 370, was exhibited by him at the meeting of the Society held on January 31st, and a close examination in every way confirmed its supposed parentage, presenting as it did in its plumage unmistakable marks of both species. Mr. Otty stated that the Tree Sparrow was the male parent, and the House Sparrow the female: it was bred at his house in Norwich in 1886, and remains in excellent health.—J. H. G., Jun.

A New Charge against Sparrows. I have known Great Tits take Bees from a hive more than once, but never, until recently, heard that Sparrows did it. Such, however, is the case in the Isles of Scilly, for Mr. Vallance, the head-gardener at Tresco Abbey, complained that one summer in particular he had lost a great many by them, and this was when an unusual amount of gum-honey exuded from the Aloes, for which Mr. Dorrien Smith's

garden is so noted, and tempted the Bees, which stuck to it and remained fast: the Sparrows then began to eat them, and having acquired a taste for Bees, afterwards proceeded to take them from the hives. The same method employed in the case of the Tits would, no doubt, be efficacious in teaching them a lesson, viz., a small mouse trap placed at the entrance of the hole of every hive. It is said that the Blue Tit takes Bees, but the captured ones which I have seen in Surrey have all been the Great Tit. Tits are such pretty birds, however, and so readily adapt themselves to boxes put up for them to nest in, that one regrets to see them killed, but I confess to no such feelings of compassion for the Sparrow—the enemy of all farmers and poultry-keepers.—J. H. G., Jun.

XVIII.

FAUNA AND FLORA OF NORFOLK.

Part XII. Phytophagous Hymenoptera (Sawflies).

By John B. Bridgman, F.L.S., F.E.S.

Read 27th September, 1887.

In presenting this list of Norfolk Sawflies, I am fully aware of its incompleteness, owing to its being mainly the result of my own collecting, with a few additions kindly given me by Messrs. F. Norgate and E. A. Atmore. Owing to want of time, I have been unable to go far from home, the localities are therefore chiefly in the neighbourhood of Norwich. I have no doubt that if any one had the time, inclination, and leave to hunt the eastern part of Norfolk, it would be found to be very prolific in Sawflies. I have found a few notices in Paget's 'Natural History of Yarmouth,' Curtis's 'British Entomology,' Curtis's 'Farm Insects,' and Stephens' 'Illustrations of British Entomology,' of which

I have availed myself. Mr. Cameron, in the 'Entomologists' Monthly Magazine' (vol. xiii. p. 173), gives the result of an inspection of Stephens' collection of British Sawflies, now in the British Museum, and the number of inaccuracies in nomenclature which he records very much reduces the value of references from Stephens' book.

The economy of the Sawflies is extremely interesting. They are, in the larval state, vegetable feeders. The majority of them feed on the outside of the leaf. Some few are leaf rollers, some again mine the leaves, others form galls on the leaves of various species of Willow, and two or three make woody galls on the young shoots of Willows.

In some species the male fly is very rare, and in a few instances quite unknown. The male of the common Sawfly which makes the galls found on almost every Willow (*Nematus gallicola*) is exceedingly rare. I was fortunate enough to breed one. The male of the very common *Eriocampa ovata*, which abounds almost everywhere where Alders are to be found, is quite unknown; and Mr. Cameron thinks it probable that the sex does not exist at all.

I have hatched eggs laid by a virgin female, but did not succeed in rearing the larvæ. Mr. Cameron and Mr. J. E. Fletcher were more successful, and reared the perfect fly from larva hatched from eggs laid by virgin females. I would refer any one who wishes to go more fully into this peculiar freak of nature, to the Introduction to Mr. Cameron's 'Monograph of British Sawflies,' published by the Ray Society, 1882.

Although not belonging to this group of insects, I should like to call attention to another peculiarity in the economy of a group closely allied to the Sawflies, viz., the Gallflies. Formerly many species were known only to exist as females, and, in spite of breeding by thousands, no one succeeded in rearing or taking a male. The round flat galls found on the leaves of the Oak were known only in one sex—the female. But Dr. Adler of Schleswig-Holstein, in 1877, announced the fact that he had discovered that these were only one form of a perfect species, so to speak; that eggs were laid by virgin females of the spangle galls (*Neuroterus*), produced the currant galls in the spring, which galls brought forth male and female insects; the females of these currant galls again, later on, produced the spangle galls. In the 'Nachrichten' for

April, 1881, is given a list of nineteen species of Gallflies which have been proved, by breeding, to exist in two forms, each form belonging to a separate genus. The life-history of these groups is extremely interesting from the abnormalities which exist among them.

One cannot but regret the gradual disappearance of favourite localities. In our time such an one in the neighbourhood of this city has disappeared. I allude to the Heigham Osier Car, once a rich spot for shells and insects, has passed away, and is now several feet beneath the yard of the Eastern and Midlands Railway. Another favourite spot of mine at Brundall is almost entirely spoiled by the Acle line. The former had gradually deteriorated, and was nothing like what it was when I was a boy. It was formerly more carefully looked after, and boys were not allowed to run over it just as they liked. In summer time the whole Car was fragrant with the scent of the Musk Beetle. I have not seen one there for many years now.

Insect collecting, in this part of the county at least, is not always unattended by danger. In this strictly preserved county gamekeepers seem to think that every one who is looking for anything, must be sneaking after game in some form or other. One morning I was walking home from Brundall on the high road, looking for insects on the banks, when I was stopped by a gentleman in fustian, who enquired: "What are you arter?" When I told him insects, he replied: "What are insex?" I showed him one of my little collecting boxes with a glass bottom, and a captive in it. He took the box, looked at it, turned it over, and returned it to me, saying: "You aint arter no insex." So asked what I was "arter." And in a withering tone, he replied: "Heggs! I've watched you sneaking along the hedge. You take my advice: when you come this way again, you just walk in the middle of the road, and don't look arter nothing,"—which, of course, I shall do. I shudder to think what would have happened if I had looked over a gate, if that gentleman could have had his way.

My thanks are due to Mr. Cameron, who has very kindly examined and named my doubtful species, and has enabled me to give, if not a very long list, one in which, I believe, the specimens are named as correctly as possible.

Family TENTHREDINIDÆ.

Tribe TENTHREDINA.

Sub-Tribe TENTHREDINIDES.

Genus TENTHREDO.

TENTHREDO LIVIDA. Lin. Very common, certainly in the neighbourhood of Norwich in June and July.

„ COLON. Klug. I took one female of this many years ago on Mousehold.

„ SOLITARIA. Scop. Mr. F. Norgate took two females of this species at Sparham in June.

„ RUFIVENTRIS. Panz. I have three females taken by Mr. Norgate at Sparham in June. These are the only Norfolk specimens I have seen. It is a tolerably common species.

„ DISPAR. Klug. I have twice taken this species in Norfolk. Once at Felthorpe in June; the locality of the other is not recorded.

„ MACULATA. Fourc. I have only one female, given me by Mr. Norgate, taken, I believe, at Sparham.

„ BICINCTA. Lin. Common.

„ MESOMELA. Lin. Very common at midsummer.

„ OBSOLETA. Klug. A female was taken by Mr. E. A. Atmore at King's Lynn in June.

„ OLIVACEA. Klug. Mr. F. Norgate took a female in June, and Mr. J. Edwards another in May. Mr. Cameron says it is common in the north, but rare in the south (Monog. Ray Soc. 1882).

„ PUNCTULATA. Klug. Common.

„ VIRIDIS. Lin. Common.

„ LATERALIS. Fab. Not common in the neighbourhood of Norwich in May and June.

„ GIBBOSA. Fall. Very common, appearing as early as the beginning of April.

Genus TENTHREDOPSIS. Costa.

TENTHREDOPSIS CORDATA. Fourc. Neighbourhood of Norwich, seemingly not common.

„ MICROCEPHALA. Lep. Norwich and Lynn.

TENTHREDOPSIS CALIGINOSA. Step. I have taken one female in this neighbourhood, but forget the exact locality.

,, NIGRICOLLIS. Cam. Common, Norwich and Lynn.

,, ORNATA. Lep. Salhouse in June.

,, TRISTIS. Step. I have one male taken by Mr. E. A. Atmore, at Lynn, in June.

,, DORSIVITTATA. Cam. I took one female at Earlham, at the end of May; it appears to be uncommon.

,, INORNATA. Cam. Not uncommon in the neighbourhood of Norwich in June.

,, NASSATA. Lin. Common in June.

,, SORDIDA. Klug. Common in June.

Genus SYNEREMA. Htg.

SYNEREMA RUBI. Panz. Stephens says: "I believe taken in Norfolk, middle of June" (Brit. Entom. 95). I have not yet met with it in the county.

Genus PACHYPROTASIS. Htg.

PACHYPROTASIS RAPÆ. Lin. Very common.

,, SIMULANS. Klug. Rare. One male has been taken by Mr. F. Norgate, probably in the neighbourhood of Sparham. Mr. Cameron says (*l.c.*) that this is the only specimen he has seen.

Genus MACROPHYA. Dbm.

MACROPHYA BLANDA. Fab. Common in the neighbourhood of Norwich in June.

,, NEGLECTA. Klug. Ditto.

,, 12-PUNCTATA. Lin. I have taken but two specimens of this species, one in the Osier Car at Heigham, (this locality has since been destroyed), and the other at Wroxham, middle of May and June.

,, ALBICINCTA. Schr. Not uncommon at Brundall towards the latter end of May.

,, RIBIS. Schr. Far from common. I have taken a female at Brundall, and a male at Eaton, one at the end of May, the other the beginning of June.

,, RUSTICA. Lin. Very common.

MACROPHYA PUNCTUM-ALBUM. Lin. This handsome insect is not uncommon in the neighbourhood of Norwich on privet fences in June.

Genus ALLANTUS. Jurine.

ALLANTUS SCROPHULARIÆ. Lin. I have taken this fine species flying about *Scrophularia nodosa*, on which plant the larvæ feeds, at Brundall. The Rev. J. L. Brown has taken it at the same plant at Postwick in August.

„ TRICINCTUS. Fab. Not common, at Brundall in August.

„ MARGINELLUS. Fab. I have taken this species at Earlham in June. It does not appear to be common.

„ ARCUATUS. Foerst. Very common.

[In Mr. Cameron's Monograph of Sawflies (Ray Soc. 1882, p. 151) he records *A. schæfferi* as having been taken by me at Norwich. This is a mistake. I have not taken it, or seen a Norfolk specimen of it.]

Sub-Tribe DOLERIDES.

Genus DOLERUS. Jurine.

DOLERUS VESTIGIALIS. Klug. I have taken two males, one at Norwich in June, and the other at Brundall in May.

„ TRIPLICATUS. Klug. Very rare. Mr. F. Norgate gave me a female which he took at Sparham in June, 1880.

„ FULVIVENTRIS. Scop. Common amongst *Equisetum*. *Dosytheus bajulus* noted in Stephens' Illustrations as occurring in Norfolk is this species.

„ ANTICUS. Klug. I have only taken the male of this species, at Brundall at the end of April.

„ ARCTICUS. Thom. I have taken two males at Brundall, one at the end of May, the other at the beginning of July, which I believe to be this species.

„ GONAGRA. Fab. Very common.

„ PUNCTICOLLIS. Thom. Brundall, far from common at the end of May, and probably June.

„ HÆMATODES. Schr. Common.

„ ANTHRACINUS. Klug. Rare. I have only taken one specimen at Eaton, the end of May.

„ FISSUS. Htg. Common.

Dolerus varispinus. Htg. Rare. I took three females many years ago at Norwich in the spring.

„ intermedius. Cam. Not uncommon, Norwich and Brundall, April and May.

„ niger. Lin. Common in June.

„ æneus. Htg. Not uncommon, Norwich, Lynn, end of May and June.

„ elongatus. Thom. Not uncommon.

Sub-Tribe Selandriades.

Genus Strongylogaster. Dbm.

Strongylogaster cingulatus. Fab. The female is very common amongst ferns, the male I have not taken.

Genus Selandria. Leach.

Selandria serva. Fab. Very common at midsummer in marshy places.

„ sixii. Voll. Heigham Osier Car, Brundall.

„ flavescens. Klug. Heigham Osier Car and Brundall, May, June, and July.

„ straminipes. Klug. Neighbourhood of Norwich and Salthouse on ferns in May and June.

„ morio. Fab. Brundall in August.

„ aperta. Htg. I have taken only one female, at Buckenham.

Genus Taxonus. Htg.

Taxonus equiseti. Fall. Common.

„ glabratus. Fall. Common.

Genus Pœcilosoma. Dbm.

Pœcilosoma luteolum. Klug. Not uncommon in marshy places. I have bred it from larvæ feeding on *Lysimachia vulgaris*.

„ pulveratum. Retz. Sparham, F. Norgate; Brundall, Lynn.

„ longicorne. Thom. Norwich, May and June.

Pœcilosoma submuticum. Thom. Strumpshaw and Brundall, end of May and June.

„ excisum. Thom. I have taken only one male of this insect at Earlham, in the middle of August.

Genus Eriocampa. Htg.

Eriocampa ovata. Lin. A very common species on alder. The female only is known. Cameron says it is doubtful if the other sex exists at all.

„ annulipes. Klug. Norwich, Brundall, common in June and July.

„ varipes. Klug. Not uncommon, Norwich and Brundall, June, July, and August.

„ limacina. Retz. I used to breed this frequently from larvæ feeding on fruit trees in our own garden. I once bred from it a new species of *Mesoleius*.

„ cinxia. Klug. I have only taken one female at Earlham, the beginning of August, 1878.

„ rosæ. Harris. Common, Norwich, Wroxham, in May.

Genus Blennocampa. Htg.

Blennocampa sericans. Htg. I took one male at Brundall on May 12th, 1882.

„ nigrita. Fab. Not uncommon, neighbourhood of Norwich at the end of May.

„ albipes. Gmel. Common, Norwich, Brundall, in May.

„ ruficruris. Brullé. I have taken this in some numbers in May at Brundall and neighbourhood of Norwich.

„ nigripes. Klug. I once took both sexes of this species against the Water Works at Heigham in August.

„ fuscipennis. Fall. Common in marshy neighbourhoods in June, Brundall.

„ ephippium. Panz. Not uncommon at midsummer, Brundall and Hellesdon.

„ fuliginosa. Schr. Not uncommon, Brundall, Norwich, end of May, June, and July.

„ subserrata. Thom. Not uncommon, Brundall, from the middle of May to July. I have taken the male as early as the middle of April.

BLENNOCAMPA PUSILLA. Klug. Common in the neighbourhood of Norwich in May and June.

,, BETULETI. Klug. I took one female on Mousehold, August 28th, 1880.

,, ASSIMILIS. Fall. I have only taken two females of this in the neighbourhood of Norwich in May.

Genus HOPLOCAMPA. Htg.

HOPLOCAMPA FERRUGINEA. Panz. Stephens says it is apparently rare, and has been taken in Norfolk.

,, CRATÆGI. Klug. I have taken this at the flowers of the whitethorn round Norwich at the end of May.

Genus EMPHYTUS. Klug.

EMPHYTUS TOGATUS. Panz. I have taken two males at Earlham at the end of May, and Mr. F. Norgate has taken the female at Sparham.

,, CINCTUS. Lin. Common on roses, either wild or in gardens.

,, CALCEATUS. Klug. Brundall in August.

,, TIBIALIS. Panz. The only specimen I possess was taken by Mr. Norgate at Sparham in September. It frequents oaks.

,, CARPINI. Htg. I have frequently taken the male and female in the neighbourhood of Norwich in May.

,, GROSSULARIÆ. Klug. Not uncommon in the neighbourhood of Norwich, end of May, June, and July.

,, TENER. Fall. Common round Norwich at midsummer.

,, PERLA. Klug. Rare. I took a male some years back in the Heigham Osier Car.

[Stephens in his "Illustrations" gives *Emphytus impressus*, Klug. as "taken in Norfolk, apparently rare," this is *Pœcilosoma guttatum*, Fall.]

Genus PHYLLOTOMA. Fall.

PHYLLOTOMA VAGANS. Fall. Common on alder, in the leaves of which the larvæ mine.

,, MICROCEPHALA. Klug. Not so common as the previous species; Norwich, Brundall, Lynn, during July and August.

PHYLLOTOMA FUMIPENNIS. Cam. This is a new species which I took at Brundall on alder, May 12th 1878. I met with but one specimen, as I could not make it agree with any description I could find, I sent it to Mr. Cameron, who said it was new, and named it (E. M. M. xxiv.).

Genus FENSUA. Leach.

FENUSA MELANOPODA. Cam. I used to take this freely on alder in the Heigham Osier Car in July.

„ PUMILIO. Htg. Taken in May and August at Norwich.

„ PYGMÆA. Klug. I have taken but two specimens of this one at Earlham, the other at Lynn in June.

„ PUMILLA. Klug. Norwich, I have bred this from the leaves of the birch.

„ ULMI. Sun. Common in Tuckswood Lane, near Norwich, the end of May and June.

Genus ATHALIA. Leach.

ATHALIA ANCILLA. Lep. Not uncommon in June.

„ SPINARUM. Fab. This pest destroyed many thousand acres of turnips in 1782. The earliest record of its appearance is 1756, they appeared at intervals up to 1838 or 1839, since which time it certainly has not caused the damage it formerly did. I do not know if it has been recently taken at all (for further particulars see Curtis's 'Farm Insects,' p. 39).

„ ROSÆ. Lin. Very abundant everywhere.

„ LUGENS. Klug. Far from common at Brundall in May and August, and perhaps the intervening months.

Tribe NEMATINA.

Genus HEMICHROA. Ste.

HEMICHROA ALNI. Lin. Common on alder in June. The male is very rare. I have twice bred this sex.

„ RUFA. Panz. Appears to be far from common. I have only bred one female from larva taken near Norwich. I was fortunate enough to breed a male from larvæ I took at Wimbledon. This sex is exceedingly scarce.

Genus Dineura. Dalb.

Dineura stilata. Klug. Abounds everywhere on hedges.

,, verna. Klug. I have only taken one specimen, in Workhouse Lane, Norwich, May 20th, 1877, and Mr. Atmore has taken one at Lynn.

,, viridorsata. Retz. Appears to be far from common. I have taken it once, and Mr. J. Edwards gave me another, both of which were taken in the neighbourhood of Norwich in May and June.

Genus Cladius. Ill.

Cladius pectinicornis. Fourc. Common, most frequently in gardens.

,, rufipes. Lep. I have taken but one specimen, at Eaton, August, 1881.

,, eradiatus. Htg. Not uncommon in May and June in the neighbourhood of Norwich. I have taken it in April, and once bred it from perforated bramble-sticks collected in the winter.

,, drewseni. Thom. Far from common, round Norwich in May and June.

,, padi. Lin. Very abundant.

Genus Crœsus. Leach.

Crœsus latipes. Villaret. Mr. E. A. Atmore gave me a female which he took at Lynn in May, 1887. Mr. Cameron says it does not appear to be common..

,, (?) septentrionalis. Lin. Mr. F. Norgate gave me a specimen which he probably took in the neighbourhood of Downham. Paget mentions it as swarming on the willows in the meadows at Gorleston. Although I have no undoubted authority for including it in this list, I have very little doubt but that Mr. Norgate's specimen was taken in Norfolk. It is a common insect, and found in numbers where it occurs.

Genus Nematus. Panz.

Nematus fulvipes. Fall. Brundall, July and August.

,, hibernicus. Cam. I have taken two specimens at Norwich, and one at Lynn.

,, crassicornis. Htg. Not uncommon in the neighbourhood of Norwich; May to July.

,, appendiculatus. Htg. Two females in the neighbourhood of Norwich.

,, cæruleocarpus. Htg. Two males at Eaton near Norwich in June.

,, lucidus. Panz. Norwich and Sparham; not uncommon; end of May and June.

,, capreæ. Panz. Common. Mr. Cameron says: "In Stephens' collection, *capreæ* Panz, is represented under the name *N. tæniatus* (in part) *hæmorrhoidalis, fallax*, and *affinis*" (Ray Society 1884, p. 103).

,, obductus. Htg. Not uncommon at Norwich and Brundall; end of May, June, and July.

,, leucogaster. Htg. Heigham Osier Car. Brundall and Felthorpe, July and August.

,, curtispina. Thom. I have taken but one specimen, in June at Heigham.

,, viridescens. Cam.

,, glutinosæ. Cam. Mr. Atmore took one male at Lynn in June.

,, miliaris. Panz. Common on willows.

,, tibialis. Newm. I took a female of this rare fly many years ago, but cannot remember the locality.

,, myosotidis. Fab. Common; June, July, and August.

,, abdominalis. Panz. I have only one specimen, which I took in the Heigham Osier Car.

,, ruficapillus. Gmel. Very common.

,, ribesii. Scop. Very common on gooseberry bushes.

,, albipennis. Htg. Felthorpe, Brundall, and Heigham Osier Car.

,, xanthogaster. Foer. Common; Norwich and Brundall, from the end of April to August.

,, leucostictus. Htg. Brundall in June, and Mr. E. A. Atmore has taken it at Lynn in May.

NEMATUS GALLICOLA. West. Very common on willows. I have bred a male of this species from galls taken in the Heigham Osier Car. This sex is very rare.

„ BRIDGMANII. Cam. I bred this insect from galls on the sallow at Brundall. The Acle line now runs over the spot where the sallows grew.

Tribe CIMBICINA.

Sub-Tribe CIMBICIDES.

Genus CIMBEX. Ol.

CIMBEX SYLVARUM. Fab. Stephens has named a species of *Cimbex, Griffinii* (Illus. of Brit. Ent. vol. vii. p. 7). This is probably only a variety of *C. sylvarum*. He says it has been taken in Norfolk. I have not met with the genus in the county.

Genus TRICHIOSOMA. Leach.

TRICHIOSOMA LUCORUM. Lin. Taken at Sparham by Mr. F. Norgate.

„ BETULETI. Klug. Common on Whitethorn in the neighbourhood of the city.

Sub-Tribe ABIDES.

Genus ABIA. Leach.

ABIA SERICEA. Leach. Sparingly at Brundall on the flowers of the Scabius. Mr. F. Norgate once gave me several males which he found sitting on alder at Dilham.

Tribe HYLOTOMINA.

Sub-Tribe HYLOTOMIDES.

Genus HYLOTOMA. Lat.

HYLOTOMA USTULATA. Lin. I have taken this at Eaton, Cringleford, and Brundall in May, but it does not appear to be common in this neighbourhood.

„ ATRATA. Foer. Mr. F. Norgate took a female in July at Sparham.

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TRANSACTIONS

OF THE

Norfolk and Norwich

NATURALISTS' SOCIETY;

PRESENTED TO THE MEMBERS FOR

1887—88.

[SUPPLEMENT.]

PRESIDENT'S ADDRESS.

NORWICH:
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1888.

ADDRESS.

By the President, Sir Edward Newton, K.C.M.G., F.L.S., C.M.Z.S., *to the Members of the Norfolk and Norwich Naturalists' Society.*

Ladies and Gentlemen—It is with much regret that I have been prevented by a serious illness not only from reading my address at the usual annual meeting on the 27th March last, but even from preparing it in time for its publication in its proper place in your Transactions; and I therefore have been obliged to ask that the publication of the remarks which I had intended to make on the expiration of my office might be postponed.

Our financial condition, as is shown by the accounts, continues to be flourishing. The number of members has increased to two hundred and sixty-seven, ten new members having been elected, but we have to regret the loss of two by death—Mr. John Gatcombe and Mr. John Brownfield.

Mr. Gatcombe, who was born at Knowle in Somersetshire, died at Plymouth, where he had resided nearly all his life, at the age of sixty-eight, on the 28th April, 1887. He was the author of many valuable and interesting observations on birds, published chiefly in the 'Zoologist,' and was an excellent draughtsman, and made many pretty drawings of birds, and by those who knew him he was highly esteemed for his tenderness towards animals.

Mr. Brownfield, the son of an Irish gentleman who in the latter part of the last century had settled in the parish of St. Saviour's in Norwich, died early in January last, at the age of seventy-eight. After completing his education in Paris, Mr. Brownfield returned to Norwich, where he rapidly acquired an extensive practice, and earned for himself a very high

reputation as an oculist. His name appears in the first list of members of this Society.

Some interesting and instructive papers have been read during the year. The list is unfortunately a short one, and the subjects treated have chiefly been ornithological. It is much to be desired that communications should be received from members on other subjects of Natural History; and I must express the satisfaction of the Society at the exhibition of fossil and geological specimens by Mr. John Gunn at several of our meetings.

Mr. Southwell's amusing account of the quaint and ancient customs with respect to the Conservation of the Fresh-water Fishes in the county, brings out the fact that the Salmon is probably the only fish formerly visiting its rivers (though even then in very small numbers) that has now ceased to do so. Whether that is due mainly to the care and forethought of the conservators by their judicious action, it is needless to speculate; but it is to be regretted by the ornithologist that the same care could not have been extended to the avi-fauna, which in a very short space of time has so terribly diminished in the same parts of the county, over which, with reference to the inhabitants of its waters, some success in preserving them has been attained. It is, on the other hand, gratifying to hear from Mr. J. H. Gurney, Junr., in his paper on the Scilly Islands, that there, at least, through the tender care of the previous and present proprietors, bird life is preserved, and it is to be hoped that many years may elapse before the extirpation of a single species now inhabiting them may take place.

Mr. Pycraft has submitted some interesting ornithological notes, but it is painful to hear of the murder of such birds as the Kentish Plover and Avocet in the middle of their breeding season. The steps lately taken by the newly formed Breydon Wild Birds Protection Society will in future, it is to be hoped, render such slaughter impossible.

Mr. Stevenson, in his paper on the Common Snipe, brings further evidence to prove, what has been almost universally admitted by ornithologists, that the peculiar "drumming" or

"bleating" of this bird is not vocal; but whether produced by the action of the wings or tail, or by both combined, still seems open to doubt.

The thanks of the Society are due to Mr. Geoffrey F. Buxton, Colonel Feilden, Professor Newton, and others for several valuable additions to its library.

In the last number of our Transactions, the zoological and botanical journals and collections made by Captain Albert Markham on his voyage to Hudson's Straits were reviewed by Colonel Feilden and Mr. Geldart respectively; and through the kindness of the proprietors of 'Good Words,' who are publishing a full account of this voyage, we are enabled to issue, as a frontispiece to this number, a portrait of Captain Markham in his travelling dress.

Having now disposed of all that I wish to say on the proceedings of the Society during the past year, I desire to call attention to a few remarks which I hope may be interesting to the majority of our members, who, I believe, like myself are most anxious for the preservation and the continued presence of our avi-fauna.

During the five years which have elapsed since my return home to England, after an almost continuous residence of upwards of twenty-four years in tropical countries, I have passed through no inconsiderable part of England and Scotland, and have made a shorter or longer stay at several different places—places varying in the physical character of their neighbourhood. From constant observation of our fauna, and especially of our birds, which I have been in the habit of making, both when I resided in England before and now, I can safely compare the existing state of things with that which I remember prior to 1858 when I first visited the tropics. The comparison, in my mind, produces a contrast which cannot be agreeable to any ornithologist. It is, of course, well known to all that several species of birds, which in those days were not so very uncommon, have since, year by year, become rarer. This fact has been recognized by the passing of several Acts of Parliament intended to preserve some of those species, and I hope that much good has thereby been effected; but

as regards many other species, I think the fact has not been so generally acknowledged by naturalists as it should be, for it is assuredly one of very considerable significance to all who busy themselves with the study of our fauna, and therefore to the members of a society like this. I am much afraid that ornithologists do not sufficiently perceive the imminent risk that a great many of our most interesting birds run of being exterminated. The Acts of Parliament to which I have just referred are doing perhaps the best that under all circumstances can be done in behalf of the species which they expressly have in view, and it is possible that by no legal process could protection be extended to other groups—to one, at least, which I have specially in mind, and to us as naturalists this group is one of very great interest, —particularly to members of this society, who have the advantage, owing to the liberality of one of its most distinguished and oldest members, of easy access to the Museum, where it is so well represented. That group is the one generally known as the "Birds of Prey," and it is among its members that I have observed the greatest contrast between what I remember of them prior to 1859 and my experience since 1883. My memory, of course, does not carry me back to the days when the larger Birds of Prey abounded, or were even not very rarely seen, though I can recall to mind the observation of a Kite in one adjoining county, and of a Buzzard and of an Eagle in another. But the sight of one or more of the smaller species—a Merlin, a Kestrel, or a Sparrow Hawk—was, at the proper season, an almost every day occurrence up to the time of my leaving the country in 1859. Now I may travel the whole length and breadth of England, to say nothing of Scotland, at any time of the year, without seeing any one of the *Falconidæ*, and the contrast in that respect is very marked. It is just the same if I take a walk into any part of the country; and in the five years since my return, I am sure I have not seen, though always on the look out, many more than a score of examples of all these three species together. It is plain, to my eyes, that in this island the extirpation of the smaller Birds of Prey is almost as fully accomplished as was that of the larger kinds some years ago.

The reason of this is, of course, manifest. It is due to the increased attention paid to the preservation of game; and looking to the high price paid throughout the whole country for the hire of shooting, and the way in which nearly everywhere the destruction of "vermin" is left wholly to the gamekeepers employed, the result is not surprising, and is perhaps inevitable. But I would point out to you that the same result will in due time follow with regard to other groups of birds. The persecution has been most intense in the case of the Birds of Prey, and accordingly its effect is the most readily apparent; but the effect of what is practically, though far less perceptibly, persecution, is just as sure, and only requires a longer period to be rendered visible.

This kind of indirect persecution is caused in many ways, and chief among them is that caused by agricultural improvement. A notable instance was that of the Bustard, many years ago, on which it is quite needless for me on the present occasion to dwell; and scarcely less striking are the changes brought about by the drainage of fens and marshes. The immense popularity of the district of the Broads as a place of recreation must, I fear, be regarded by all naturalists as threatening the home of several species, all the more to be regretted as some of them have no other in this island. The greater attention paid to plantations and timber generally may not on the whole have so unfavourable a result; for, though the removal of decayed or unhealthy trees must injuriously affect certain species by depriving them of the portion of their food which is supplied by wood-infesting insects, some compensation is given in the way of shelter to other species; and it must also be admitted, while lamenting the effects of game-preservation in extirpating our Birds of Prey, that it undoubtedly affords increased security and protection to many of our smaller woodland birds, not, it is true, that they generally stood in need of those benefits.

These same causes which have led to the extirpation of many species of birds in the British Isles have also operated in the total extinction of others in other islands, chiefly those called Oceanic: and have been aggravated by the savage

practice of burning large tracts of forest and other growth, for the purpose of preparing the ground for artificial cultivation. Here I can speak from experience, as I have learnt to know their effect in a distant part of the world, where I have spent some fifteen years of my life. You are doubtless aware that a very large proportion of the species of birds which were not only indigenous, but peculiar, to the Island of Mauritius has ceased to exist; and the same is to be said of those of two other islands—one, Bourbon, now called La Réunion, its near neighbour, and another, Rodrigues, lying some three hundred miles to the eastward, but with an avi-fauna from the same original stock. These three together are commonly spoken of as the Mascarene Islands, from the old Portuguese navigator, Mascaregnas, who discovered two, at least, of them. No complete list of the existing and extinct species of birds of these islands has ever been made, and I therefore propose to add one to these remarks, which, with the assistance of my brother, Professor Newton, I have drawn up, thinking thereby some service may be done to the study of ornithology by furnishing in a compendious form a considerable amount of information not easily obtained. To make the list the more useful, I have included in it the species of birds known to exist in the Seychelles archipelago—a group of islands lying, it is true, about nine hundred miles to the northward of the other three islands—but forming undoubtedly a part of the same fauna, which in its turn is subsidiary to that of Madagascar.

We have undeniable and, in some instances, abundant evidence that each of the three islands which form the Mascarene group has lost several of its indigenous species, notably the Dodo, Solitaire, and other species with limited powers of flight, and as these species were most assuredly peculiar to these islands, *i.e.* did not exist elsewhere, the result is that they have become extinct.

The extinction of the more or less flightless birds was however complete more than a century ago, and was probably to a great extent due to the introduction of foreign mammals, Pigs, and Monkeys, a practice which, though it may have originated with the

best of motives, later days have shown to be in many parts of the world not only a means of destruction of the native animals and plants, but also of serious injury to the economic interests of the country into which the foreigners have been unluckily imported. As to the Wild Geese, Ducks, and perhaps some other birds, of which mention is made by the older navigators, it is impossible to form any opinion, not that I wish to imply disbelief in their statements.

To begin with the Island of Bourbon, as that lying nearest to Madagascar, we know that even within the lifetime of our contemporaries it was inhabited by two species of birds now extinct, the one a rather abnormal Starling, and the other a Parrot, the stuffed skins of which still remain in one museum or another, though not in any museum in this country. A third species, a Weaver Bird, belonging to a genus well represented in the other islands of the whole group, was described in the last century by Buffon, and figured by Daubenton. The specimen which furnished the description and figure no longer exists, so far as I can ascertain. I have never heard of any one now living who has ever seen an example of the bird. In like manner a Parakeet, described and figured as an inhabitant of the island, has certainly not been found there for many years past, though it has generally been thought to be specifically identical with one that now survives in Mauritius. There is also the undoubted testimony that a species of Dodo, distinct as it would seem, and as might be expected, from that which inhabited Mauritius, dwelt in Réunion, to say nothing possibly of other birds less clearly indicated. But not even a bone of this Dodo, nor any figure of it which we can with certainty trust, remains to us now, so far as any one has been able to discover.

Passing now to Mauritius. Besides the Dodo, of which so much has been written, we have incontestable evidence of the former existence of four or five other kinds of birds, which have for a longer or shorter time become extinct. That which seems to have survived the longest was a beautiful Dove, belonging to the genus or sub-genus *Alectroenas*, and peculiar to the Madagascar

sub-region, and formerly known as the "Pigeon Hollandais," from its colours—red, blue, and white—being those of the Dutch flag. It must have been common enough, once on a time, according to all accounts; but I am not aware that at present more than three or four examples of its skin remain, and the only one of these in Britain is in the Museum of Science and Art at Edinburgh. It doubtless still existed at the beginning of the present century, but we cannot do more than suppose that its extinction was accomplished by the year 1830, or perhaps even sooner. Another lost bird was a very large Parrot, as proved by bones found in the peat of the Mare aux Songes, a marsh * which has furnished so many remains of the Dodo that we are now acquainted with almost the entire osteology of the bird. The portions of this Parrot's skeleton as yet found have been only sufficient to indicate to Professor Alphonse Milne-Edwards the natural affinities of the form; but most fortunately an outline sketch of the bird's appearance, made by one who was obviously a good draughtsman, still exists in Holland, and shows that it possessed a large crest, and had, as seems likely, wings so short as to render it incapable of flight. Bones of a large species of Coot, now extinct, the sole evidence of its existence, and of a still more curious form, determined by Professor Milne-Edwards also to belong to the *Rallidæ* have likewise been recovered from the same peat. This last form is one of considerable interest, because no one can look at the long curved bill which it possessed without recognizing in it the "Poule rouge à bec de Becasse" mentioned by one of the early voyagers, and also the strange bird depicted by a painter at Vienna, probably from a living example in the menagerie there, in a figure which has been beautifully reproduced by the late Herr von Frauenfeld. Moreover we have its likeness in a sketch by the same Dutch draughtsman as preserved to us the representation of the large Parrot, so that of this bird—*Aphanapteryx*—we can form a very fair conception, though it is out of our power to say when it ceased to exist.

* This marsh, and a small one in the district of Flacq, are to the best of my knowledge the only places in which the Dodo's bones have been found.

That other birds of Mauritius are dwindling in numbers there is I think no doubt. Since my residence in the island, a law has been passed which affords them, I trust, some protection, and may possibly preserve them to future generations. Yet there is one which very nearly came to an end in my time, and though not quite extinct in the island, I may just mention the circumstances relating to it. This is a Swallow or Martin belonging to the genus *Phedina*, and is one of the few land-birds that is found both in Mauritius and in Réunion. In Mauritius it seems, so far as my experience goes, to have been always very local, and its numbers were so much reduced by a cyclone which ravaged the island between the 12th and 17th of February, 1861, that I never afterwards saw but three or four from that time till my departure in 1878.

If we go to Rodrigues, we find that extirpation has overcome a still larger proportion of birds. There is not only the "Solitaire," the large Didine bird, taller than the real Dodo, of which Leguat has left us such a minute and wonderfully truthful account; but the caves of the island have produced the bones of a small Owl, perhaps akin to that which now inhabits, but in very small numbers, one of the Seychelle Islands; a large Parrot, nearly as big as the extinct short-winged Parrot of Mauritius; a Dove, probably the species described by Leguat as having a slate-coloured plumage, and if so, most likely belonging to the genus *Alectroenas*, of which the finest species inhabited Mauritius, as I before said; a Ralline bird, also mentioned by the early voyagers as being attracted to any red substance, and certainly not very far removed from the Mauritian *Aphanapteryx*; and a Night-Heron, with wings shorter than those of any existing species. Moreover, there is still existing, but of the utmost rarity, a Parakeet, congeneric with that which still survives in Mauritius, and with that which, as we read, formerly lived in Réunion. Of this Parakeet, mentioned by Leguat as being numerous, only two specimens have come into the hands of naturalists, and these were obtained at a considerable interval of time. Mr. Slater, the zoologist attached to the Transit of Venus Expedition, failed to procure a specimen, and though

especially instructed to look out for it, saw only a single example. Mr. Caldwell, who spent upwards of three months in the island, was lucky enough to procure for me, from one of the inhabitants, the second of the known specimens, and he says that he saw several of the birds, but was unable to get near them. It is plain its destiny is sealed; and when I state that only two other indigenous species of land-birds are now known to exist on this distant island, and these are peculiar to it, you can judge of the extent to which the extinction of its avi-fauna has been carried.

And now as to the Seychelles, a little archipelago which, from the general similarity of its fauna,* I cannot but regard as being closely related to the Mascarene Islands proper. From the comparatively small influence which man has as yet exerted on the group, and the absence (so far as is known) of any of the flightless forms of birds, I am not aware of any of its species which has become extinct, but that the process of extirpation is even here at work is very evident. Of its indigenous land-birds all but one seem to be peculiar, and several of them appear to have a very confined range, being restricted to only a few of its islands, and two of them, the Black Parrot (*Coracopsis barklii*), and the Long-tailed Flycatcher (*Terpsiphone corvina*), perhaps to one or, at the most, two only. It is certain that as cultivation extends, and the native forests are destroyed, all these peculiar species run great risk of extermination; while I know that one of them—a Parakeet (*Palæornis wardi*)—already has had its numbers thinned by direct persecution on account of the damage it inflicts on the crops of maize. Of course it is just possible that, if the progress of cultivation in these islands is slow, some of the indigenous species may contrive to adapt themselves to the changed conditions in which they will find themselves; but at the same time experience forbids us to expect that this will be the case to any great extent, and, therefore, I fear we must regard the endemic

* I am of course aware of some peculiarities which the Seychelles present, especially in other branches of the animal kingdom, and even in the highest of its divisions, the *Vertebrata*, as witness the existence there of the group *Cæcilia*, a problem most difficult of explanation.

species, *i.e.* the whole of the land-birds of the Seychelles, with the single exception of the Swift, supposed to be *Collocalia francica*, as doomed to a more or less speedy extinction.

I think there is no need for me to occupy your attention longer by any attempt at summing up what I have been saying. It is in the power of any one, with these facts before him, to see the inevitable result. All that I would in conclusion ask you to bear in mind is that this lesson, conveyed from distant colonies, should not be lost. The causes that have produced, are producing, and will produce extinction in the Mascarene Islands and in the Seychelles are precisely the same as those that have been, that are, and that will be in operation in the United Kingdom. Here the operation is slower, there it is quicker. That is really the only difference.

(APPENDIX TO THE PRESIDENT'S ADDRESS.)

LIST OF THE BIRDS OF THE MASCARENE ISLANDS, INCLUDING THE SEYCHELLES.

† Signifies that the species is extinct.
¶ „ „ peculiar, *i.e.* not found elsewhere.
§ „ „ of accidental occurrence.

N.B.—Several more species are indicated by other writers as being found in one or the other of the Mascarene Islands, and in most cases apparently in good faith; but in the absence of positive evidence which may lead to their scientific determination, it has been thought advisable to omit them from this list. It is to be hoped that subsequent investigations may bring to light the remains of at least some of them.

Quality	Name.	La Réunion	Mauritius	Rodrigues	Seychelles	Other places within the range.
	PASSERES.					
	STURNIDÆ.					
† ¶	Fregilupus varius (Boddaert)	×				
† ¶	Necropsar rodericanus, H. H. Slater			×		
	PLOCEIDÆ.					
† ¶	Foudia bruante (P. L. S. Müller)	×				
¶	„ erythrocephala (Gmelin)		×			
¶	„ flavicans, A. Newton			×		
¶	„ sechellarum, E. Newton				×	
	NECTARINIIDÆ.					
¶	Nectarinia dussumieri, Hartlaub				×	
	ZOSTEROPIDÆ.					
¶	Zosterops borbonica (Boddaert)	×				
¶	„ e.-newtoni, Hartlaub*	×				
¶	„ mauritiana (Gmelin)		×			
¶	„ modesta, E. Newton				×	
¶	„ olivacea (Linnæus)	×				
¶	„ chlorophæa, Hartlaub		×			
¶	„ semiflava, E. Newton				×	

* Mr. Sharpe refuses to admit the validity of this species (*cf.* B. Brit. Mus. vol. ix. pp. 195, 196); but extraordinary as it may be that two nearly-allied species should exist in one small island, he does not explain the discrepancy of size noticed by Dr. Hartlaub, who in describing the present had a far larger series of specimens before him than, it appears, Mr. Sharpe had.

Quality	Name.	La Réunion	Mauritius	Rodrigues	Seychelles	Other places within the range.
	SYLVIIDÆ.					
¶	Drymœca (?) rodericana * A. Newton			×		
¶	Ellisia sechellensis, Oustalet *				×	
¶	Pratincola tectec (Gmelin)	×				
	TURDIDÆ.					
¶	Copsychus sechellarum A. Newton				×	
¶	Hypsipetes borbonicus (Gmelin)	×				
¶	,, olivaceus, Jardine & Selby		×			
¶	,, crassirostris, E. Newton				×	
	MUSCICAPIDÆ.					
¶	Terpsiphone bourbonnensis (P. L. S. Müller)	×	×			
¶	,, corvina, E. Newton				×	
	LANIIDÆ.					
¶	Oxynotus newtoni, Pollen	×				
¶	,, rufiventer, Swainson		×			
	HIRUNDINIDÆ.					
¶	Phedina borbonica (Gmelin)	×	×			
	PICARIÆ.					
	CYPSELIDÆ.					
¶	Collocalia francica (Gmelin)	×	×		×	
	CORACIIDÆ.					
§	Eurystomus glaucurus (P. L. S. Müller)		×			
	CUCULIDÆ.					
§	Cuculus rochi, Hartlaub		×			
	PSITTACI.					
	PSITTACIDÆ.					
† ¶	Mascarinus duboisi, W. A. Forbes	×				

* Mr. Sharpe (Cat. B. Brit. Mus. vol. vii. pp. 102, 103) places these two species in a genus *Bebrornis*, which he includes in the Family *Timeliidæ*. Under present circumstances I prefer leaving them under the designation of their original describers.

Quality	Name.	La Réunion	Mauritius	Rodrigues	Seychelles	Other places within the range.
	PSITTACIDÆ (*continued*).					
† ¶	Lophopsittacus mauritianus (Owen)		×			
† ¶	Necropsittacus rodericanus A. Milne-Edwards			×		
¶	Coracopsis barklii, E. Newton				×	
¶	Palæornis eques (Boddaert)*	†	×			
¶	„ exsul, A. Newton			×		
¶	„ wardi, E. Newton				×	
	ACCIPITRES.					
	STRIGIDÆ.					
† ¶	Carine murivora (A. Milne-Edwards			×		
¶	Gymnoscops insularis, Tristram				×	
	FALCONIDÆ.					
¶ (?)	Circus maillardi, J. Verreaux	×				
	„ æruginosus (Linnæus)				×	
	Haliaetus vociferoides, Des Murs		×			
	Falco peregrinus, Tunstall		×			
	„ eleonoræ, Géné		×			
¶	Tinnunculus punctatus (Temminck & Laugier)		×			
¶	„ gracilis (Lesson)				×	
† ¶	Astur sp. indet.		×			
	HERODIONES.					
	ARDEIDÆ.					
	Ardea cinerea, Linnæus					Amirantes
	„ gularis, Bosc	×				
	„ leucoptera, Boddaert		×			
	„ garzetta, Linnæus	?				
	„ bubulcus, Savigny	?	?			On board ship in the Indian Ocean 1864

* Extinct in La Réunion whence it was originally described. Its existing representative in Mauritius may perhaps be distinct, and if so should bear the name of *P. echo*.

Quality	Name.	La Réunion	Mauritius	Rodrigues	Seychelles	Other places within the range.
	ARDEIDÆ (*continued*).					
	Ardeola sinensis (Gmelin)				×	
	Butorides atricapilla (Afzelius)		×		×	Amirantes
† ¶	Nycticorax megacephala, (A. Milne-Edwards)			×		
	IBIDIDÆ.					
§	Ibis bernieri, Bonaparte (?)					Agalega
	STEGANOPODES.					
	FREGATIDÆ.					
§	Fregata minor (Gmelin)	×?	×	×	×?	
	PHAETHONTIDÆ.					
	Phaethon rubricauda, Boddaert					Round Is.
	„ flavirostris, Brandt	×	×	×	×	Tromelin, Cargados
	SULIDÆ.					
	Sula piscator (Linnæus)	?	×	×		Aldabra, Tromelin, Cargados
	ANSERES.					
	PHŒNICOPTERIDÆ.					
§	Phœnicopterus erythræus* J. Verreaux ?		×	×		
	COLUMBÆ.					
	DIDIDÆ.					
† ¶	Didus ineptus, Linnæus		×			
† ¶	„ (?) borbonicus, Schlegel	×				
† ¶	Pezophaps solitaria (Gmelin)			×		
	COLUMBIDÆ.					
† ¶	Alectorœnas nitidissima (Scopoli)		×			
¶	„ pulcherrima (Scopoli)				×	
† ¶	Columba (?) rodericana, A. Milne-Edwards‡			×		

* Perhaps formerly of more regular occurrence.

‡ Perhaps an *Alectorœnas*.

Quality	Name.	La Réunion	Mauritius	Rodrigues	Seychelles	Other places within the range.
	COLUMBIDÆ (*continued*).					
¶	Columba meyeri, Marchal -		×			
¶	Turtur rostratus, Bonaparte -				×	
¶	„ aldabranus, Sclater -					Aldabra
	GRALLÆ.					
	RALLIDÆ.					
† ¶	Aphanapteryx broeckii (Schlegel)		×			
† ¶	„ leguati (A. Milne-Edwards			×		
§	Hypotænidia pectoralis (Lesson)		×			
	Gallinula pyrrhorrhoa, A. Newton	×	×			
	„ chloropus (Linnæus) -				×	
	„ sp. indet.*					St. Denys
	Porphyrio madagascariensis (Gmelin)‡	×	×			
§	„ alleni, Thomson			×		
† ¶	Fulica newtoni, A. Milne-Edwards		×			
	LIMICOLÆ.					
	CHARADRIIDÆ.					
	Squatarola helvetica (Linnæus)	×	×		×	
	Ægialitis geoffroyi (Wagler)	×	×		×	
	„ pecuaria, (Temminck & Laugier)	×	×			
§	Glareola ocularis, J. Verreaux		×			
	Strepsilas interpres (Linnæus)	×	×	×	×	
	Dromas ardeola, Paykull				×	
	SCOLOPACIDÆ.					
	Tringoides hypoleucus (Linnæus)	×	×		?	
	Totanus glottis (Linnæus)				×	

* In 'The Ibis' for 1867 (p. 358) I mentioned three Water-hens sent alive to me from St. Denys, an island some seventy miles to the north of the Seychelles, which then appeared to me to be referable to *G. chloropus*. I afterwards came to the conclusion, in which others agreed with me, that they deserved recognition as a distinct form. One of them made its escape from the Zoological Gardens, another was killed and eaten by a Gull, and the third, when it died, was so disfigured by its captivity of nearly four years that I have forborne to describe its remains.

‡ Possibly introduced.

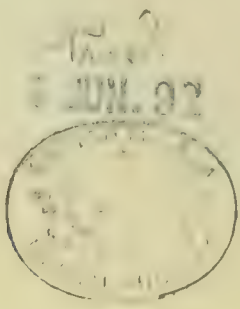
Quality	Name.	La Réunion	Mauritius	Rodrigues	Seychelles	Other places within the range.
	SCOLOPACIDÆ (*continued*).					
	Terekia cinerea (Güldenstädt)		×			
	Tringa cinclus, Linnæus	?				
	„ subarquata (Güldenstädt)		×			
	„ minuta, Leisler				×	
	Numenius madagascariensis (Linnæus)	×	?	×	×	
	„ phæopus (Linnæus)	×	×	×	×	
	GAVLE.					
	LARIDÆ.					
	Anous stolidus (Linnæus)		×	×	×	
	„ tenuirostris, Temminck & Laugier	×	×		×	
	Sterna fuliginosa, Gmelin		×	×		St. Brandon
	„ anæstheta, Scopoli	×	×	×	×	
	„ bernsteini, Schlegel					Round Is., Ile de la Baleine, St. Brandon
	„ bergi, Lichtenstein			×	?	
	„ dougalli, Montagu	×	×			Cargados
§	„ melanogaster, Temminck & Laugier	×				
	„ balænarum, Strickland				×	
	Gygis alba (Sparrman)	×	×	×	×	St. Brandon Aldabra, Tromelin
	TUBINARES.					
	PROCELLARIIDÆ.					
	Procellaria melanogaster (Gould)					At sea between Mauritius and Madagascar
¶	Œstrelata (?) aterrima (J. Verreaux)	×				
	Puffinus chlororhynchus, Lesson	×	×		?	
	„ obscurus (Gmelin)?	×	×		×	
	Prion desolatus (Gmelin)		×		×	

Obs.—MM. Schlegel and Pollen (Recherches etc. pp. 144, 145) mention examples of other species of this group preserved in the museum of St. Denis, and said to have been obtained on or near La Réunion :—

Daption capensis	Oceanites oceanica
Procellaria æquinoctialis	Ossifraga gigantea
P. cinerea	Diomedea chlororhynchus
P. vittata	

N.B.—The following is an approximate List of species of Birds which seem to have been introduced into the islands :—

Name.	La Réunion	Mauritius	Rodrigues	Seychelles	Native country.
Acridotheres tristis	×	×		×	India
Passer indicus	×	×			India
Crithagra chrysopyga		×			South Africa
„ canicollis	×	×			South Africa
Foudia madagascariensis	×	×		×	Madagascar
Estrelda astrild	×	×			South Africa
„ amandava	×	×			India
Munia punctularia	×	×			India
Padda oryzivora	×	×			Malacca
Psittacula cana	×	×	×		Madagascar
Anas melleri	×	×			Madagascar
Dendrocygna viduata		×			Madagascar
Numida mitrata		×	×		Madagascar
Francolinus ponticerianus	×	×	×		India
„ pintadeanus	×	×			China
Margaroperdix striata	×	×			Madagascar
Coturnix argoonda		×			India
Syncœcus sinensis		×			China
Turtur picturatus	×	×		×	Madagascar
„ chinensis		×			China
Geopelia striata	×	×		×	Malay Iss.



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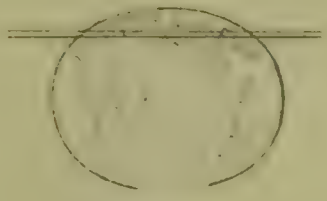

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The Treasurer in Account with the Norfolk and Norwich Naturalists' Society, Year ending 26th March, 1889.

Dr.	£	s.	d.
To Balance from last year	13	14	10
,, Subscriptions :—			
2 for 1886–87	0	10	0
7 ,, 1887—88	1	15	0
191 ,, 1888–89	47	15	0
1 ,, 1888—89	0	10	0
11 ,, 1889—90	2	15	0
1 ,, 1890–91	0	5	0
1 ,, 1891—92	0	5	0
	53	15	0
,, Additional payments for monthly notices	0	13	0
,, Sale of *Transactions*	2	12	0
,, Donation :—J. H. Gurney, Jun., Esq.	1	5	0
,, Interest	0	12	9
	£72	12	7

Cr.	£	s.	d.
By Fletcher and Son, for Printing *Transactions*, 1887—88	34	17	0
,, Goose and Co., for Printing	1	3	6
,, Norfolk Chronicle Company, for ditto	1	6	6
,, Jarrold & Sons, for ditto	0	14	3
,, Plowright's *British Ornithologist*	0	8	0
,, S. Norris, for Hire of Chairs	1	19	0
,, Advertisements	0	10	0
,, Insurance	0	3	0
,, Postage and Carriage	5	19	6
,, Gratuity to Doorkeeper...	0	10	0
,, Rent of Room	1	1	0
,, Museum Subscription	2	2	0
,, Assistant-Secretary's Salary	5	0	0
,, Balance at Messrs. Gurney's	17	7	10
	£72	12	7

LIFE MEMBERSHIP FUND.

	£	s.	d.
To Balance from last year	86	8	11
,, 1 Composition for Membership	3	0	0
,, Interest	1	14	0
	£91	2	11

By Balance in Post Office Savings Bank £91 2 11

Norwich, 26th March, 1889.

Examined and found correct,

STEPHEN WM. UTTING, *Auditor.*

List of the Publications received by the Society as Donations or Exchanges from March, 1888 to March, 1889.

ABBEVILLE. Mémoires de la Société d'Emulation d'Abbeville. 3d Serie, 4e vol.

——— Bulletin des Procès-Verbaux de la Société d' Emulation d' Abbeville, 1881–84, 1886—87. 5 nos. 8vo.
From the Norwich Geological Society

BARROIS (Charles). Recherches sur le Terrain Crétacé Supérieur de l'Angleterre et de l'Irlande. 4to. Lille, 1876.
From the Norwich Geological Society

BATH Natural History and Antiquarian Field Club. Proceedings, vol. vi. no. 3. 1888. *From the Club*

BELGIUM. Annales de la Société Royale Malacologique de Belgique. Tome 22. Année 1887. Royal 8vo. *From the Society*

——— Annales de la Société Géologique de Belgique. Tomes xii—xv, 1884—88. Royal 8vo.
From the Norwich Geological Society

BERWICKSHIRE Naturalists' Club. Proceedings, vol. xi. no. 3. 1887.
From the Club

BOTANY. Reports and Papers on Botany. Published by the Ray Society. 2 vols. 8vo. Lond. 1846—49.
From Professor Newton, F.R.S.

BOWERBANK (J. S., LL.D.). A Monograph of the British Spongiadæ. 3 vols. 8vo. Lond. 1864—74. *From Professor Newton, F.R.S.*

BRISTOL Naturalists' Society. Proceedings, New Series, vol. v. part 3. 1887—88. *From the Society*

BRYCE (James, M.A., LL.D., F.G.S.). Geology of Clydesdale and Arran; embracing also the Marine Zoology and the Flora of Arran, with complete lists of species. 8vo. Lond. 1859.
From the Norwich Geological Society

BUCH (Leopold von). Reise durch Norwegen und Lappland. 2 vols. 12mo. Berlin, 1810. *From Professor Newton, F.R.S.*

CALIFORNIA Academy of Sciences. Bulletin, no. 8. 8vo. San Francisco, 1887. *From the Academy*

——— State Mining Bureau. Fourth and seventh Annual Reports of the State Mineralogist, 1884 and 1887. 8vo. Sacramento, 1884—87. *From the Bureau*

CARDIFF Naturalists' Society. Transactions, vol. xix. part 2, and xx. part 1. 1887—88. *From the Society*

Chamberlain (Walter, F.Z.S.). Notes on Non-Volant Birds. Being a Paper read to the Members of the Largo Naturalists' Society, 2nd August, 1888. pp. 16. 8vo. *Cupar*, 1888

Cornwall Royal Geological Society. Transactions. Vol. xi. part 3. 1889. 8vo. *From the Norwich Geological Society*

Douglas (John William) and Scott (John). The British Hemiptera. Vol. i. 8vo. Lond. 1865. *From Professor Newton, F.R.S.*

Edinburgh Royal Society. Proceedings, vol. xii. part 2; xiii. parts 1 and 2; xiv. part 1. 1883—87. 8vo. *From the Society*

——— Geological Society. Transactions, vol. v. part 4, 1888. *From the Society*

Edwards (James). A Synopsis of British Homoptera-Cicadina. (From the Transactions of the Entomological Society of London, June 1886, pp. 41—129, and March 1888, pp. 13—108.) 8vo. *From the Author*

Essex. The Essex Naturalist: being the Journal of the Essex Field Club. Vol. ii. nos. 4—10. 8vo. *From the Club*

Galpin (Rev. F. W., M.A., F.L.S.). An Account of the Flowering Plants, Ferns, and Allies of Harleston. With observations on the Birds of the District, by Charles Candler. 8vo. Harleston 1888. *From the Author*

Geological (The) Magazine. A Monthly Journal of Geology. Vols. 2, 6, 7, 8. 8vo. Lond. 1865—71. *From the Norwich Geological Society*

——— (The). Record for the years 1874 to 1879. Edited by William Whitaker, B.A., F.G.S., and W. H. Dalton, F.G.S. 6 vols. 8vo. Lond. 1875—87. *From the Norwich Geological Society*

Geologists' Association. Proceedings, vol. viii. no. 6; vol. ix. nos. 5, 8; vol. x. nos. 1—8, 1884—88. 8vo. *From the Norwich Geological Society*

Glasgow Geological Society. Transactions, vol. viii. part 1, 1883—85. 8vo. *From the Norwich Geological Society*

——— Natural History Society. Proceedings, New Series, vol. ii. part 1. 1886—87. *From the Society*

Greene (Joseph Reay). A Manual of the Sub-Kingdom Cœlenterata. 12mo. Lond. 1863. *From the Norwich Geological Society*

Gurney (John Henry). On an apparently undescribed species of Owl from Anjouan Island, proposed to be called *Scops capnodes*. (From the 'Ibis' for January, 1889, pp. 104—7.) *From the Author*

Gurney (J. H., Jun., F.L.S.). On the occasional assumption of the Male Plumage by Female Birds. (From the 'Ibis' for April 1888, pp. 226—230.) *From the Author*

——— Ornithological Notes from Norfolk. pp. 6. (From the 'Zoologist,' January 1889.) *From the Author*

Gurney (J. H., Jun., F.L.S.) On the occurrence of *Charadrius virginicus* in Leadenhall Market, London. pp. 2. 8vo.
From the Author

Hampshire Field Club. Papers and Proceedings, nos. i, ii, 1887—88. 8vo. *From the Club*

Hertfordshire Natural History Society and Field Club. Transactions, vol. iv. parts 8 and 9, and vol. v. parts 1—3. 1887.
From the Society

Hincks (Thomas, B.A.). A History of the British Hydroid Zoophytes. 2 vols. 8vo. Lond. 1868.
From Professor Newton, F.R.S.

Huxley (Professor, F.R.S.). Lectures on the Elements of Comparative Anatomy. 8vo. Lond. 1864.
From the Norwich Geological Society

——— and Hawkins (Waterhouse B.). An Elementary Atlas of Comparative Osteology in twelve Plates, the objects selected by Professor Huxley, F.R.S., and drawn on Stone by B. Waterhouse Hawkins. 4to. Lond. 1864. *From the Norwich Geological Society*

Ibis (The), a Quarterly Journal of Ornithology. Edited by Philip Lutley Sclater, M.A., Ph.D., F.R.S., and Howard Saunders, F.L.S., F.Z.S. Fifth Series, nos. 22, 23, 24, and Sixth Series, no. 1. London, 1888—89. *From Mr. G. F. Buxton, F.Z.S.*

Lille. Société Géologique du Nord. Annales xii. 1884—85. 8vo.
From the Norwich Geological Society

Liverpool Geological Association. Transactions, vol. vii. 1886—87. 8vo. *From the Norwich Geological Society*

——— Geological Society. Proceedings, vol. v. part 4. 1887—88. 8vo. *From the Norwich Geological Society*

London Geological Society. Quarterly Journal, vol. 26. 1870. 8vo.
From the Norwich Geological Society

——— Royal Geographical Society. Proceedings, April, 1888 to March, 1889. *From Mr. H. G. Barclay, F.R.G.S.*

——— Royal Microscopical Society. Journal. Second Series, April, 1888—February, 1889. *From the Society*

——— Quekett Microscopical Club. Journal. Second Series, vol. iii. nos. 21, 22, and 23. January to April, 1888.
From the Club

——— Royal Institution of Great Britain. Proceedings. Vol. xii. part 2. 1889. 8vo. *From the Institution*

Lubbock (Sir John, Bart., M.P.). Monograph of the Collembola and Thysanura. 8vo. Lond. 1873. *From Professor Newton, F.R.S.*

Macpherson (Rev. H. A., M.B.O.U.). Report on Pallas Sand-grouse (*Syrrhaptes Paradoxus*) in the north-west of England. (Reprinted from the 'Transactions of the Cumberland and Westmoreland Association for the advancement of Science,' no. 13, pp. 59—75. 1888.) *From the Author*

Manchester Geological Society. Transactions, vol. xviii. nos. 18, 19; vol. xix. nos. 1, 20; vol. xx. nos. 1, 3. 1886—89. 8vo.
From the Norwich Geological Society

Marine Biological Association of the United Kingdom. Journal. Nos. 1, 2. 1887—88. 8vo. *From Professor Newton, F.R.S.*

Miller (Samuel H., F.R.A.S.) and Skertchley (S. B. J., F.G.S.). The Fenland, past and present. Royal 8vo. Wisbech, 1878.
From the Norwich Geological Society

Nature. A weekly Illustrated Journal of Science. Vols. 1—4. 1869. *From the Norwich Geological Society*

New Zealand Institute. Transactions and Proceedings; edited by Sir James Hector, K.C.M.G., M.D., F.R.S. Vol. xx. 8vo. Wellington, 1888. *From the New Zealand Institute*

Northamptonshire Natural History Society and Field Club. Journal, nos. 34—36. 1888. *From the Society*

Northumberland. Natural History Transactions of Northumberland, Durham, and Newcastle-upon-Tyne. Vol. ix. part 2. 1888; and x. part 1. 8vo. *From the Society*

Owen (Richard, F.R.S.). Odontography; or, a Treatise on the Comparative Anatomy of the Teeth. 2 vols. royal 8vo. Lond. 1840—45. *From the Norwich Geological Society*

Paris. Feuille des Jeunes Naturalistes. Nos. 210—209. Avril, 1888—Mars, 1888. *From the Society*

Plowright (Charles B., F.L.S.). A Monograph of the British Uredineæ and Ustilagineæ. 8vo. Lond. 1889. *Purchased*

Plymouth Institution and Devon and Cornwall Natural History Society. Annual Report and Transactions. Vol. x. part 1. 1887—88. *From the Plymouth Institution*

Reid (Clement). Notes on the Geological History of the Recent Flora of Britain. (From the 'Annals of Botany,' vol. ii. no. 6, August, 1888.) 8vo. *From the Author*

Russia. Nouveaux Memoirs de la Société Impériale des Naturalistes de Moscou. Tome xv. nos. 3, 4, 5. 4to. Moscou, 1885—88.
From the Society

——— Bulletin de la Société Impériale des Naturalistes de Moscou. Année 1888, nos. 2, 3. *From the Society*

Simonin (L.). Underground Life; or, Mines and Miners, by L. Simonin. Translated by H. W. Bristow, F.R.S. Royal 8vo. Lond. 1869. *From the Norwich Geological Society*

United States of America. Annual Report of the Smithsonian Institution for the year 1885. Part 2. 8vo. Washington, 1886.
From the Smithsonian Institution

——— Mineral Resources of the United States. By Albert Williams and David T. Day. 1882—87. 5 vols. Washington, 1883. *From the Norwich Geological Society*

United States of America. Monographs of the United States Geological Survey. Vols. ii—xii. 4to. Washington, 1882—86.
From the Norwich Geological Society

Vol. ii. Tertiary History of the Grand Cañon District. With Atlas. By Clarence E. Dutton, Capt. of Ordnance, U.S.A. 1882.

Vol. iii. Geology of the Comstock Lode and the Washoe District. With Atlas. By George F. Becker. 1882.

Vol. iv. Comstock Mining and Miners. By Eliot Lord. 1883.

Vol. v. The Copper-bearing Rocks of Lake Superior. By Roland Duer Irving. 1883.

Vol. vi. Contributions to the Knowledge of the older Mesozoic Flora of Virginia. By William Morris Fontaine. 1883.

Vol. vii. Silver-Lead Deposits of Eureka Nevada. By Joseph Story Curtis. 1884.

Vol. viii. Paleontology of the Eureka District. By Charles Doolittle Walcott. 1884.

Vol. ix. Brachiopoda and Lamellibranchiata of the Raritan Clays and Greensand Marls of New Jersey. By Robert P. Whitfield. 1885.

Vol. x. Dinocerata. A Monograph of an extinct order of Gigantic Mammals. By Othniel Charles Marsh. 1886.

Vol. xi. Geological History of Lake Lahontan, a quaternary Lake of North-western Nevada. By Israel Cook Russell. 1885.

Vol. xii. Geology and Mining Industry of Leadville, Colorado. With Atlas. By Samuel Franklin Emmons. 1886.

——— Bulletin of the United States Geological Survey. Nos. 2 to 47. 8vo. Washington, 1883—88.
From the Norwich Geological Society

——— Report of the Commissioner on Fish and Fisheries for 1882. 8vo. Washington, 1884. *From Mr. T. Southwell, F.Z.S.*

——— Annual Report of the Comptroller of the Currency to the First Session of the 49th Congress of the United States. 8vo. Washington, 1885. *From the Norwich Geological Society*

— — American Museum of Natural History. Annual Report for the year 1887—88. 8vo. *From the American Museum*

——— Journal of the Trenton Natural History Society. No. 3. January, 1888. 8vo. *From the Society*

Wien. Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien. Vols. 16—22. 8vo. Wien, 1866—72. *From Professor Newton, F.R.S.*

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From Mr. G. F. Buxton, F.Z.S.

ADDRESS.

Read by the President, Mr. J. H. Gurney, Jun., F.L.S., *to the Members of the Norfolk and Norwich Naturalists' Society, at their Twentieth Annual Meeting, held at the Norfolk and Norwich Museum, March 26th, 1889.*

Ladies and Gentlemen—When it was for the second time proposed that I should accept the office of your President, I did not hesitate to accept the compliment with gratitude, and in the same spirit in which the honour was offered I appreciate it. Living near Norwich I have had no difficulty in attending to take the chair at meetings, and can truly say that there has not been one of them but has been full of profit and interest; and if Dr. Shephard Taylor, to whom I this evening yield up the presidency, is as fortunate in the papers which are read as I have been, he has much which is agreeable to look forward to.

The first summer excursion was to Eaton Common and Keswick Woods, and was largely attended. A fine day enabled those who cared for flowers and insects to seek for them each in his own way, after which the party, under my guidance, made their way to Keswick Hall, and while some strolled about, others gave their attention to the late Mr. Hudson Gurney's collection of books and manuscripts.

The July excursion was to Loddon, when the members proceeded by waggonette to Langley Park, where they were met by Sir Reginald Beauchamp. In a large wood, comprising about ninety acres, they had the pleasure of examining various trees, including an Ash of great height, measuring more than ten feet in circumference

at five feet from the ground. They were also shown a Wild Duck, which had selected the top of a thatched shed for the place of her nest; the colour of her plumage so closely resembling the colour of the old shed that it was difficult to distinguish the one from the other. The Flowering Rush and the small upright St. John's Wort were among the plants found by our botanists that day. On the 16th of August, a few members travelled to Hethersett by the 3.20 train and investigated the Natural History of East Carlton, under the guidance of Mr. Bussey, tea being provided at the Curzon Hall Farm, but the attendance was very small.

I for one regard with disfavour the proposal to abandon these summer outings. As long as ladies and gentlemen are found to join in them and make up a pleasant party, whose object is observation and natural history, we have a proof of their popularity, and then again, the object for which they are maintained is *partly* to interest others besides ourselves.

The scientific meetings for the year have, on the whole, been very important, and the articles which are about to be printed in the 'Transactions' will afford sterling evidence of this. Part 5 will conclude Vol. iv., which will certainly not be inferior to its predecessors.

At our April meeting Mr. G. Smith exhibited two White Wagtails, shot near Yarmouth, being the first properly authenticated Norfolk-killed specimens, there being more or less doubt about all others previously; and Mr. John Gunn part of a left antler of *Megaceros hibernicus* (Owen) from Pakefield, from a bed considered to be the upper part of the Norwich Crag; while your President gave an account of Heligoland. This island speck in the North Sea is celebrated for its birds, which are, practically speaking, all migrants, for the resident species are so few that they can be counted on the fingers of one hand. Ornithologically, it owes its celebrity entirely to the energies of one man, Herr Gätke, now a veteran in the cause. He came to the island, as a young artist from Prussia, nearly half-a-century ago, and has ever since kept an accurate register of all the birds which have been shot on Heligoland; and when it is remembered that more rarities have been got there than at any place of

like size in the world, some idea may be obtained of his labours. In electing him an honorary member of this Society a few years ago, we paid him a deserved compliment. Could our friends at Norwich but see him in his home they would enjoy his ornithological sanctum, filled with rare birds of his own stuffing. Mr. Utting and Mr. Southwell, who paid him a visit in August, found him very well, and engrossed in his favourite pursuits, some of the results of which he hopes shortly to publish in English and German.

Heligoland (*i.e.* Holy Island) is a small island in the shape of a triangle, one mile in length. At the time of my visit the sea was tinged with a broad pink band, derived from the red clay of which the cliffs are composed. The north-west corner is the only part of the cliffs where Guillemots breed, and there are no Puffins or Razorbills.* At the end of July a calm day is selected, and a fleet of row-boats, including all the best which the island can muster, headed by his Excellency the Governor, proceed to the cliff, and the Governor having fired the first shot the battue forthwith begins. After the shooting season has thus been opened in due form, any one is at liberty to shoot them; and full advantage is taken of this by the Heligolanders, who consider the "*Skout*" a very good roast, though they do not gather the eggs. It is curious that they employ the name of *Skout* in the Frisian tongue, identical with the Guillemot's provincial name at Flamborough Head. We found nursery operations in full swing, and many dead Sand-eels at the foot of the cliff testified to the abundant provision made for the young Guillemots whose platforms are very lofty.

At the May meeting Mr. G. F. Buxton brought the subject of the Pallas' Sand Grouse under discussion, and the steps which should be taken to protect them. It was the feeling of the meeting that this was quite in accordance with the objects of this Society. Letters were written and circulated, and met with a general response. The local gentlemen and land-owners of the County, from H.R.H. the Prince of Wales downwards, co-operated, but on common lands, where there was no one to protect them, many were

* When Mr. Cordeaux visited Heligoland, in 1874, Razorbills bred there, and Homeyer found a few in 1880.

shot. The Earl of Leicester gave especial orders for their protection at Holkham, where, in consequence, they remained on the sandhills near the sea and were unmolested. I regret that no one has given us an article for our pages on the irruption of these Sand Grouse. It has, however, been done, and very well done, by Mr. Southwell in the 'Zoologist' (1888, p. 442). At the time of writing it is not certain that any are left in the County, but a pair in confinement at Northrepps Hall are very flourishing, and may possibly produce eggs in time.

At this meeting an article by Lord Lilford was read, treating of some portion of the Raptorial Collection in the Lilford Aviaries, which have been well known to scientific men for many years. His paper is full of interesting facts and observations, but I need say no more of it, as it is to appear in full in our 'Transactions.' The only regret of those present was, that the state of Lord Lilford's health did not allow him to be present with us to read it himself, an office which Mr. W. H. Bidwell undertook in his absence. Mr. H. D. Geldart also read some notes on 'The Flora of Harleston,' in which he praised that work highly for its accuracy, arrangement, and execution, and at the same time pointed out the value of the labours of such local associations as the Harleston Botanical Club, of whose observations this Flora is a record. Mr. Galpin's work will probably be a very valuable help when another British Flora is published; and the appendix on Birds, by Mr. C. Candler, is very well done and includes one hundred and twenty-six species, of which the rarest is the Dusky Shearwater, which was for some time on view at the Museum.

In September Lord Lilford sent for exhibition the only Norfolk-killed specimen of the Roseate Tern, which he has presented to the Museum, and the Rev. William Barlee showed some admirable photographs of his Mute Swans at Cringleford. Mr. James Edwards also favoured us with a sight under the microscope of some minute frog-like forms of life from the gizzards of *Sylvia nisoria* and *Cyanecula suecica* recently obtained in Norfolk by Dr. Power.

In October Colonel Butler sent a Hawfinch's nest, beautifully preserved, on a Cedar bough from Herringfleet, and Mr. Bridgman

showed a new species of Ichneumon, coming very near to *Apanteles octonarius*, from cocoons of the Lobster Moth. Mr. R. M. Christy gave us a second paper on the supposed interbreeding of the Blackbird and Thrush, adding ten more reputed instances to those which were given before (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 588), while Mr. W. H. Bidwell read a very interesting and valuable paper on "Obsolete Dishes," in which he alluded to the information which Naturalists can glean from books of household accounts and bills of fare of mediæval times, and brought forward many instances to show that Englishmen in the middle ages made the best of the fauna and flora of the country to fill their larders, and to cure such diseases as are within the compass of the gentlewoman's skill.

In November Mr. Clement Reid contributed a paper on the sections of the cliff at Corton, laid bare by Mr. Colman for the visit of the Geological Congress, and Mr. Charles Bussey a paper on the origin of the names of various familiar beasts, birds, and reptiles, which my absence from Norfolk unfortunately prevented my hearing.

On the 29th of January the Secretary read "Notes on the Food of some North American Birds of Prey, compiled from the Report of the United States Department of Agriculture," by Mr. J. H. Gurney; and Lord Justice Lindley sent for exhibition a volume of very beautifully executed Botanical Drawings by the late Dr. Lindley, which were viewed with much interest by our botanical members, one of whom, Mr. Geldart, favoured us with some remarks about them.

In February the public were invited to hear Mr. Mann's treatise on Falconry, and to see his live Falcon "Vic," which he brought with him, as well as a working model of the hat and appliances used for taking Peregrines on passage in Holland, and gloves, bells, jesses, leashes, hoods, such as are used by falconers in their craft. Mr. Hamon le Strange, on whose property at Hunstanton Mr. Mann had been recently hawking, made some practical remarks on this nearly obsolete form of sport, which seems now likely to be in a measure revived, and was followed by Mr. C. L. Buxton, who complimented the lecturer on the thorough mastery which he had obtained over his subject.

At the same meeting Mr. Candler produced a fine collection of Flint Implements from the North Island of Japan, and your President showed, on behalf of Mr. R. J. Howard, an instantaneous photograph of Gulls in flight.

The obituary for the year contains the name of Henry Stevenson, a good all-round naturalist, but best known as an ornithologist, who passed away at the age of fifty-five, and leaving the ornithological "work," with which his name will ever be associated, incomplete. The 'Birds of Norfolk' is a publication of which any county may be justly proud, and has done more to foster a love of nature in East Anglia than anything which has ever issued from the press. Its accomplished author was one of the founders of our Society, and its warm friend and supporter always, succeeding to the Rev. J. Crompton as second President in 1871, and afterwards taking office as one of the Vice-Presidents. It is not too much to say, that every paper in our pages which proceeded from his pen teems with interest. I would but refer to "The Meres of Wretham Heath," "The abundance of Little Gulls in 1869—70," "The Wild Birds' Protection Act," and his annual record of Norfolk-killed rarities, kept up with so much pains in our 'Transactions' and in the 'Zoologist.' Of his liberality in imparting information on all ornithological matters one who knew him well can speak. His knowledge was not confined to the birds of one county; whatever he knew he placed it at the disposal of all comers, and truly a love of nature was the only introduction ever needed by him when asked for information about birds.

One cannot but regret that the magnificent collection of stuffed birds, over which he spent much money and spared no pains, was not secured intact for the Museum collections, but the friends of that institution did their best to raise money for that purpose, and with the fund, at all events some of the choicest rarities were secured, of which some account is given by Mr. Southwell (*antea* p. 498). To this gentleman he has bequeathed the task of completing the 'Birds of Norfolk,' and it could not be in better hands; and we may hope that he will speedily bring this important work to a successful termination, though the task will not be a light one.

Mr. Stevenson died on the 18th of August, 1888. His family, originally from Nottinghamshire, had for upwards of a century been proprietors of the 'Norfolk Chronicle,' the management of which Mr. Stevenson only resigned when compelled thereto by ill health in 1886. He was Honorary Secretary of this Museum for nearly thirty-four years, and took a great interest both in the British Birds and in the Raptorial collection.

Another member of our Society has passed away in the Rev. Churchill Babington, D.D. He was a contributor to Sir J. Hooker's 'Journal of Botany,' to the 'Flora of New Zealand,' the 'Transactions of the Royal Society of Literature,' the Cambridge Antiquarian Society, and 'Watson's Botanist's Guide,' and author of the 'Ornithology and Botany of Charnwood Forest, Leicestershire' (1842), and of the 'Birds of Suffolk' (1884).

Mrs. Charles Foster, who has also passed away, though not attending the meetings, manifested a great interest in the Society.

I am sorry to say that, besides those lost to us by death, Mr. Quinton informs me nine members have retired. On the other hand, we have added thirteen new ones, and the numbers now stand—Honorary Members, 15; Life Members, 30; Ordinary Members, 223.

Among the additions to our Library may be mentioned four volumes of the 'Ibis,' and four of the 'Zoologist,' from Mr. Geoffrey Buxton, and a Report on Pallas' Sand Grouse in the north-west of England by the Rev. H. A. Macpherson, and several books from Professor Newton. But the chief addition has been the books belonging to the Norwich Geological Society, which has recently been dissolved, consisting of about fifty volumes, including the publications of the United States Geological Survey Office (which will make the volumes already belonging to the Society a more perfect set), 'Owen's Odontography,' 'Miller and Skertchly's Fenland,' 'Woodward's Geology of Norwich,' etc.

The retirement of our Honorary Secretary, Mr. W. H. Bidwell, after eight years of active service, calls for something more than an ordinary vote of thanks for all his labours, and indeed he carries away the gratitude of all of us for the good work he has done on

behalf of this Society. To him it has assuredly been a labour of love to help in the way he has done, and that his absence from the official post he held so long will mean no diminution in his hearty desire for the welfare of an association now twenty years old, we may be certain.

In his successor, Mr. E. Corder, we have one who is fond of natural science in all its many branches, to whom we hold out the hand of welcome on his assumption of office.

As it is usual for each President to occupy some portion of his Address, on retiring from the presidential chair, with the consideration of some scientific subject, I will lay before you a few notes on Hybridism among Birds, in continuation of some which have been published in the 'Zoologist' and in your 'Transactions.' In the first place I will refer to a supposed crossing between a Stock Dove and our Domesticated Pigeon.

Whether the Stock Dove (*Columba œnas*) described in the 'Zoologist' (1885, p. 150) by Mr. Whitaker, killed in Nottinghamshire, was really a cross between that species and a tame Pigeon, or whether it was merely a pied variety of the Stock Dove, it would be difficult to decide; but the fact of its being on record that the two have crossed in a semi-domestic state is evidence that Mr. Whitaker's bird may be what he suspects, viz., a hybrid. I refer to the experiences of Mr. Lingwood, and to a discussion which took place in the 'Field' some years ago on this subject between a gentleman who signed himself C. L. S. and the late Mr. B. P. Brent. Mr. Brent's success was this—he paired a cock Stock Dove with a hen Dragon Pigeon, and a hen Stock Dove with a cock Antwerp Pigeon. From these about thirty hybrids were hatched, of which four grew up. The one which lived longest was bred from the hen Stock Dove. In the same way the experiences of Mr. Lingwood, related in Churchill Babington's 'Birds of Suffolk' (p. 105), attest the possibility of a cross between a tame Pigeon and a Stock Dove, but probably the progeny would be generally barren. This, however, was not the case with Mr. Lingwood's, for the hybrid "paired [with a domestic Pigeon] and brought up young ones the following season."

A curious instance of a very rare hybrid being sent over from the United States to England happened in January, 1884. This bird was between the Sharp-tailed Grouse (*Pediœcetes phasianellus*) and the Pinnated Grouse (*Cupidonia cupido*), and I have the pleasure of laying it on the table. It was picked up at a well-known poulterer's at Brighton by Mr. H. Langton, and I think you will be of opinion that it is a very good specimen. Dr. Coues, the celebrated American naturalist, considered it a very great rarity indeed, when he was in this country, and requested that full particulars about it might be sent to him, which was done.

Most naturalists will agree with Mr. Cambridge-Phillips, that wild-bred hybrids are generally produced through either one or the other of the parent birds being unable to obtain a proper mate. Yet it is hard to see how this can be so in the British Isles with the Greenfinch and Linnet, which interbreed oftener than any other two birds, and which are so common that one would think they might easily obtain mates at all times (*cf.* 'Zoologist' 1883, p. 379; 1887, p. 266).

It seems highly probable that hybridism among birds in a wild state takes place far oftener than has been hitherto supposed, and if it be so, numerous variations in plumage which have puzzled collectors are at once accounted for. Who could possibly distinguish a hybrid between the Chiffchaff and the Willow Warbler? And why should it be thought improbable that the Pied and White Wagtails habitually hybridize? Intermediate birds between the Common and the Parrot Crossbill have from time to time occurred—one such was shot this autumn in Suffolk,—and thence it has been concluded by many that these two forms are not good species, but why may not the explanation be that they sometimes hybridize?

I.

NOTES ON RAPTORIAL BIRDS IN THE LILFORD AVIARIES.

By The Right Honorable Lord Lilford.

Read 29th May, 1888.

Having been informed by a Member of your Society that some notes from me on my living collection of birds at Lilford would be acceptable to those interested in ornithology, I venture to enclose the following remarks and observations.

I have for the last forty years, more or less, kept various birds alive in captivity, and having always had a strong predilection for the *Raptores*, many interesting birds of that class have, at one time or another, been inhabitants of the Lilford aviaries. I therefore propose to begin with the Eagles now existing in my possession, and observing the old rule of *seniores priores*, commence with the White-tailed Eagle (*Haliaetus albicilla*), of which species a fine female is the oldest inhabitant of my vivaria. This bird was taken from the nest in the Coomeragh Mountains, co. Waterford, in the early spring of 1854, and has since led an uneventful, but, I trust, not unhappy, existence at Lilford. She laid an egg, without making any nest, in 1862, for the first time, and two in the following year, but has since abstained from this profitless performance. She is now in magnificent plumage, and has moulted very regularly throughout her life. Having been bullied by a boy who had partial charge of her, during the first part of her career at Lilford, she chose an opportunity, and got him down upon his back, with the talons of one foot deeply driven into his thigh whilst with the other she clutched his jacket and

waistcoat, in dangerous proximity to the jugular vein, and would, I am persuaded, have soon killed him, had not assistance been promptly rendered. Since that time she has remained somewhat savage, though she allows her keepers to clean out her abode without molestation. She is not particular as to food, but, I think, prefers live Bream to anything else that we have offered to her. The only other bird of this species that I ever kept at Lilford for any considerable period of time, was caught by a man employed in trimming a fence, not far from Oundle, in the winter of 1875. This bird had been wounded in one thigh, which was badly fractured; and, as we subsequently discovered, a shot pellet had also struck the skull just above one of the eyes. The thigh set itself, with some clumsy assistance, and the bird was able to rest upon the injured limb and use the foot, but remained subject to occasional fits of vertigo, and died about three years after its capture without having assumed any feathers of the mature dress.

Since 1853 I have never been without one or two living Golden Eagles. The two of that species now at Lilford were taken from a nest in the highlands of Inverness in 1877, and are, I believe, a pair. Be this as it may, one of them laid an egg last year (1887), on March 29th, without making any nest. Both birds became very savage when the egg was approached, but broke it in a few days; they then made a large nest, but did not lay in it. This year (1888) I heard from the man in charge of the aviaries that these Eagles completed a nest of sticks, wool, and dry grass, about March 20th. The first egg was laid on April 2nd, but broken a day or two afterwards. A second "fine egg" was laid on the 5th, upon which the Eagle at once began to sit. No Golden Eagle had ever laid at Lilford before the first above-mentioned instance. I do not consider that these two Eagles acquired their fully mature plumage till 1884, when they had completed their seventh year. I brought a young Golden Eagle taken from a nest in a Pine tree near San Ildefonso in 1865 to Lilford, and placed it with a Scotch specimen of about four years old. As the Spanish bird advanced in years, although it moulted normally every year, I was very much struck by the great difference in *build* and general aspect between it and the British Eagle, its companion in captivity. In total length there was very little apparent difference; but the neck and

tail of the Spaniard were considerably longer, and the body very considerably smaller than in the Highlander. The former stood high on the legs, and although it became very tame, never acquired the air of dignified composure that is generally so noticeable in this species. These two Eagles were males. I may here mention that a nest of Golden Eagle with which I was formerly well acquainted in Scotland some years ago, could be easily reached without climbing of any sort; and another in the same district, though wonderfully well concealed, could be reached by two or three steps from a made pathway on to the branches of a small Birch tree which hung over a waterfall of a small burn. I am glad to hear that the former nest is still annually used by the Eagles, and strictly protected by the lessee of the forest. At some distance above the second nest mentioned were two or three small pinnacles of granite cropping out from a gentle slope of moor; these were much used by the Eagles as resting places, and the ground about them was always strewn with pellets, of which I examined a considerable number. With the exception of one, in which I found a few bones and feathers of a Ptarmigan, these pellets were composed exclusively of the bones and fur of Alpine Hares and Rabbits. As I write (April 27th), I hear from Lilford that my Golden Eagles are taking their turns of sitting on two eggs.

I have two Imperial Eagles (*Aquila mogilnik*), procured for me from Bulgaria by the late Dr. Bree in 1887. I believe that it was upon one of these birds that Dr. Bree principally founded his *Aquila striata* of the second edition of his 'Birds of Europe.' Both of these birds are now in very fine plumage, and are remarkably quiet and pacific towards several congeners that have at various times occupied the same compartment of my Eagle-sheds. I formed an intimate acquaintance with the Imperial Eagle during two winters' shooting in Epirus and Albania, where it is by no means uncommon at that season, though I could not discover that it nests near the coast. This Eagle is a bird of the plains, and, as far as I am aware, altogether avoids mountainous districts.

Of the Spanish White-shouldered Eagle (*Aquila adalberti*), I have at present four alive at Lilford: three of these were taken from a nest in the wild country, on the proper right of the Guadalquiver, below Seville, in 1869, and the other from the same district

a few years afterwards. These birds are in fine plumage, with the characteristic white shoulders very fully developed. This species is, or I fear that I must now say, was, common in the wooded plains of central and southern Spain, and in habits appears to resemble *Aquila nœvioides* very closely. The nest is generally placed in the crown of a tree, often an isolated Cork tree, and by no means always at any great height in such cases; but when the birds select a Pine tree surrounded closely by others, as often happens, the nest is generally built so as to command an extensive view over the forest. These Eagles feed principally upon Rabbits. On one occasion we found a huge Rat in a nest containing two young birds at a short distance from the lodge in which we were staying. I used to send a lad up to this nest every day to bring away the quarry that he might find there, to feed some young birds of the same species that we had taken from a more remote nest. The climber avowed that he never found anything in the shape of prey in this nest but Rabbits and the Rat above mentioned. I was told by the natives that this Eagle will feed upon carrion; but though I have seen hundreds of Vultures, Kites, and other birds, at the frequent carcases of Horses and horned cattle in the open marisma, I never detected one of this species amongst them. Whilst one bird is on the eggs, the other is often to be seen soaring at a great height, occasionally giving utterance to a short yelp. The full complement of eggs is three, but often only two are laid.

My birds at Lilford are very tame, but very noisy: their cries much resemble those of the White-tailed Eagle. I think that I may confidently affirm that the White-shouldered Eagle does not assume the complete adult plumage till its sixth or seventh year, and does not breed till this plumage is attained. The plumage of the immature birds varies greatly. I have seen specimens in which the head, neck, breast, back, and wings, except the primaries, were of an almost uniform tawny buff colour; but as a rule the ground colour of these parts is of a darker shade, and often, perhaps generally, interspersed with dark brown feathers. This species, I imagine, never at any period of its existence assumes the striated plumage of the young Imperial Eagle; but the Eagles that inhabit or occasionally visit Europe, have been the cause of many diversities of opinion

amongst ornithologists, and to no one are we all so much indebted for the elucidation of these difficulties as to our distinguished member, Mr. John Henry Gurney, Sen.

Of the Tawny Eagle *(Aquila rapax)* I have now one specimen at Lilford. It has been in my possession for a good many years, but as I have had several of the species in captivity at various times, and have not my note-books at hand for reference, I cannot positively state when I purchased it, but I think that I am well within the mark in saying that it has been at Lilford for at least twenty years. It is, I believe, a female, and though it has for several years past dropped one of its wings it is in very perfect plumage, and apparently in good health. This bird, and all the others of its species that I have possessed alive, were bought from one or other of the two well-known London dealers, Mr. C. Jamrach and Mr. Castang, and said to have been received from Mogador. My bird is in the tawny mottled plumage so well represented by Mr. Wolf in the 'Ibis' for 1865, and has changed very little during its stay at Lilford.

It appears to be a well-established fact that there are two distinct races of *Aquila rapax* in Northern and North-western Africa, one of which, well represented as above mentioned, alters but very slightly with advancing years; whilst the other, which I may call the light-coloured form, changes by slow degrees from a light earthy brown to a yellowish cream colour. Of course I am only using general terms, without going into any details of plumage. I am quite convinced that I have seen *Aquila rapax* in Andalucia, as stated in the 'Ibis' for 1865 by me (p. 172). But when my friend Colonel Irby and Mr. Dresser established the identity of the many cream-coloured Eagles' skins received from Spain with *Aquila adalberti*, it was generally assumed that I had been mistaken; and although my conviction remained unshaken, I could not produce a Spanish specimen of this Eagle, and was content to keep my opinion to myself. Of course it is impossible for me to prove positively that I saw a bird that I cannot produce in evidence; but I am very glad to say, that within the last few weeks, I received a male Eagle killed near Malaga, which was exhibited by Colonel Irby at a meeting of the Zoological Society on May the 5th inst., and allowed by all those interested in the subject to be a specimen of the light-coloured race of *Aquila rapax*. My living bird at

Lilford has enjoyed for several years the comparative liberty of a walled yard wired in at top, in which she could use her wings freely till the "droop" above alluded to came on. She is very quiet, and lives at peace with several other raptorial birds. I found this species by no means uncommon in the near neighbourhood of Tunis, in the autumn of 1856, but know very little of its natural haunts and habits.

Of the Steppe Eagle (*Aquila nipalensis*) I have two very fine specimens purchased from Castang in 1887 and 1888, and said to have been sent from Bulgaria. From various causes I have seen but very little of these birds, and beyond the fact that one of them lived in harmony with my Imperial Eagles can give no particulars. I never met with this Eagle in a wild state. I bought during the last winter an Eagle from Jamrach (without seeing it), which he in his letter to me called *Aquila naevia*. Mr. H. E. Dresser was good enough to examine this specimen, and informed me that it was a fine Spotted Eagle (*Aquila clanga*). This bird, said to have been sent from the Tyrol, is the first of its species that has ever been offered to me alive for sale, and I am very anxious to see it. This, the larger race of Spotted Eagle, was exceedingly common in the marshy forests and plains of Epirus, in the winter of 1856 and 1857-8, and a few pairs breed in those districts. They seemed to me to feed principally upon small reptiles, and their general habits and cry much resemble those of the Common Buzzard.

I have had at various times several of Bonelli's Eagle (*Pseudaetus bonellii*), and have one at present, purchased from one of the London dealers, and said to have been sent from Mogador. This individual is in fine adult plumage, very wild and savage, as have been all its species that I have kept alive. They do not thrive with me at Lilford as most of the other species of Eagles do. I do not think that we even managed to keep one for more than five or six years. Bonelli's Eagle is to be met with in most of the mountain ranges of Spain and North Africa, it is also common in the island of Sardinia, in Epirus and Crete, and I have a nestling in skin shot in Cyprus in 1887. A pair of this species nest annually on the Mediterranean side of the Rock of Gibraltar. In the early part of February, 1872, I had the pleasure of seeing the nest with the old bird sitting, from the Signal Station at the top of the rock. Colonel Irby in his most useful work, 'The Ornithology of the

Straits of Gibraltar,' has given many interesting details concerning these Eagles, which may often be seen hovering and hunting over the western or town side of the rock.

In Epirus, Sardinia, and Tunis, we used constantly to see one or two of these Eagles during our winter shooting expeditions, haunting the marshes in pursuit of wild fowl, and I have several times recovered wounded Ducks by their agency. On one occasion, having killed a Mallard with my first barrel, and mortally wounded another with my second, I marked the latter to the ground at a very considerable distance, and on approaching the spot was suddenly aware of an Eagle busily engaged in plucking my bird within fifty yards of me in the open. He allowed me to get within twenty paces, and seemed inclined to dispute my claim by lowering his wings, and setting up his crest, but eventually flew off with great reluctance to a neighbouring tree. I could not harden my heart to shoot him; and I was often afterwards assisted by him, or others of his species in the same locality, in my stalks after wild fowl, for as long as one of these Eagles was hanging overhead, I found the Ducks very unwilling to rise from their covert, and thus obtained many shots.

The stoop of Bonelli's Eagle from the clouds at a flock of wild fowl is a splendid sight. If the Ducks were at a good height the Eagle never missed the selected victim; and the remainder of the flock would come plunging down to the marsh, scattered like the sparks from an exploding rocket. In the summer months these Eagles remain in the mountains, and prey upon Partridges, Pigeons, and, in Spain, on Rabbits; but in winter they come down to the plains, and seemed to me to feed almost exclusively on wild fowl. The nest is generally placed in a steep cliff: the eggs, two in number, are laid early in February. A pair of these Eagles used to breed in a range of rocky cliffs not far from Butrinto, in Epirus; and I have often been much amused by seeing them come out and buffet the Griffon Vultures, as the latter sailed slowly to and from their nests in the same range. In fact, the Eagles would not tolerate the close proximity of any large bird of prey. I have been assured by a Spanish professional wild-fowl shooter, that he once witnessed a fierce encounter between one of these Eagles and an Eagle Owl, on the ground in the open Marisma. They were so savagely engaged that they allowed of the man's very close approach.

No prey was visible as the *casus belli*, and I have no doubt that the Eagle from her "pitch," seeing the Owl so far from its usual haunts, was, as most diurnal Raptores invariably seem to be, attracted by curiosity in the first instance, very possibly by an apparently easy capture to follow, and must have been considerably astonished on finding that she had tackled a real "tartar," for the Eagle Owl is, for its size, one of the strongest and most courageous of birds, and most assuredly does not deserve the epithet of "*ignavus*," which many authors have applied to it.

I have at present a pair of Booted Eagles (*Aquila pennata*), taken from the nest in Andalucia in 1887. I have had many of this species alive, but could never succeed in keeping them for more than a year or two, although they do not seem to pine or fret in captivity, and generally become very tame. My present birds have, as their keeper informs me, bathed constantly throughout this last severe and protracted winter. I have made very intimate acquaintance with this beautiful little Eagle in its natural state, in Central and Southern Spain, to which districts it is a common summer visitor, arriving in Andalucia about the end of March, and generally leaving the country in September. To give some idea of the abundance of this species in the province just named, I may mention that we found sixteen occupied nests in the first fortnight of May, 1872, in the Coto de Donana, a sandy wild of some thirty miles in circumference, to the west of the mouth of the Guadalquiver, belonging to the Duke of Medina Sidonia, and preserved, after a fashion, for the shooting of Red Deer, Wild Boars, Lynxes, and small game. These nests were all built in the thickest portions of the forest of Stone Pines, which covers the greater part of this preserve, and were almost invariably situated close to the trunk of the tree, resting upon two or more horizontal boughs, composed of sticks and mosses, always lined with fresh green twigs of pine, willow or cork; and at the time of which I am writing contained in all but two instances two fresh eggs a-piece: the two exceptions only held one egg each. The regular complement is two, and I have heard of three. The usual colour of these eggs is a very pale bluish-white, occasionally blotched or spotted with pale rust colour. The parent birds sit by turns, and if one of them is killed, and the nest left undisturbed, the other will be on the nest in a few minutes. The Booted Eagle sits very close, and on being put off

dashes downwards nearly to the ground, and makes off at great speed. The mournful wail of this Eagle was one of the most frequent of bird notes in the Pine woods of which I am treating, where from the nature of the country small birds are comparatively scarce. We found this Eagle common in the neighbourhood of Aranjuez in New Castile, where there are no Pine woods. The nests in that neighbourhood were generally built very high, in Plane or White Poplar trees. In the magnificent Pine forests on the northern side of the Sierra de Guadarrama in Old Castile, this Eagle is abundant, and we found several nests in May and June, 1865. The Booted Eagle is a great destroyer of Partridges and Quails, which it takes on wing and from the ground, and is altogether a bold and dashing Raptor, very different in habits and style from the Kites and Buzzards which abound in most of the wooded portions of Spain. I met with this species occasionally in Algeria, and I know of several instances of its occurrence and breeding in France, where it is however by no means a common bird.

The next bird that calls for notice at my hands is the Serpent, or Short-toed Eagle (*Circaetus gallicus*), of which I have at various times had several alive at Lilford, from Spain and Mogador, and one from the Crimea. The only one now alive in my possession was bought last year from a London dealer, and said to have been received from the second locality above named. This is another of Eagles that never seem to do well for any length of time in captivity, probably on account of the difficulty in supplying the natural food, *i.e.* Reptiles. During the winter months, the birds of this species that I have kept fed readily upon small fishes and Frogs, and would also eat the flesh of Rabbits and birds, but always appeared to have a difficulty in plucking fur or feathers. They are singularly stolid, sluggish birds, and inclined to sit in one spot for hours together, after the fashion of Owls in daylight. The cry is a feeble twitter. My falconer lately wrote, that the Serpent Eagle, now at Lilford, never seemed to have any idea of taking shelter in the heaviest falls of snow or rain with which we have been indulged during the past winter, and would only leave his perch when driven from it by one of the Kites, Buzzards, or Egyptian Vultures that share the yard with him. This bird is common in the districts in Southern Spain that I have described in treating of

Aquila pennata. The nests, of which we found several, were vast flattened masses of sticks, lined with finer twigs and coarse dry grass, and generally placed in the crown of a Stone Pine. In one instance, the tree in which we found a nest was entirely covered with sand to within six or seven feet of its summit, and from some of the higher sandhills in its proximity we could see right into the nest. We never found, or heard of more than one egg in a nest of Serpent Eagle, dirty white in colour, very rough in texture, and large in proportion to the size of the bird. In every nest that we found were some remains, either of Snakes or Lizards, and we more than once found one of these reptiles dead, but quite intact, in nests containing an egg. The species that seemed to furnish the principal prey of this Eagle in South Spain were, *Coluber lacertina*, *Tropidonotus viperinus*, *T. natrix*, and *Lacerta ocellata*. In Tunis I often observed this species in the close vicinity of the great salt lagoon that lies between Goletta and the city of Tunis, and I am convinced that small fishes were the attraction to these birds in that locality. In Spain we generally observed the Serpent Eagle soaring at no very great elevation over the open sandy wastes, but we also met with it in the mountains of Old Castile: and there on one occasion saw a pair of Hobbies, whose nest was no doubt not far off, stoop repeatedly and actually strike one of these Eagles, who merely uttered a feeble twittering protest, and plunged into the nearest thick covert of the forest. It has occurred to me, that, from the violence with which I have seen other birds of prey attack the Serpent Eagles, that they may be egg stealers, as we know that all the Harriers are. Be that as it may, I have seen Kites, Buzzards, Harriers of more than one species, a Lanner (*Falco feldeggii*), and the Hobbies as above mentioned, attack and drive away the present species. With this, I leave the Eagles, merely adding that my Golden Eagle's nest at Lilford, previously mentioned, has, during the writing of these notes, proved a failure, as the birds devoured one of the eggs, and the other, after having been sat upon for nearly a month, was found to be quite rotten.

Of the Vultures now at Lilford, I give the first place to a female Cinereous Vulture (*Vultur monachus*), taken from the nest in Old Castile, in June 1865. As I have given very full details of this capture in the 'Ibis' of 1866 (p. 388), I will not repeat them here; but merely say that I do not recollect to have seen any coloured

figure of this species that gives any approximate idea of its fully adult plumage. That given by Mr Dresser, in his excellent work on the 'Birds of Europe,' is a very good representation of the plumage of the bird up to seven or eight years of age, during which period it may be very fairly called Black Vulture. I have never been able to detect any reason for the epithet *Cinereous*, as applied to this species, that is, if I rightly apprehend it to mean ash or cinder coloured, and I have merely adopted the term most generally in use. The true adult plumage of this Vulture may be roughly termed dingy brown, in fact, it very nearly approaches that of the Sociable Vulture (*Otogyps auricularis*), with which species I had frequent opportunities of comparing it, as one of the latter species lived at Lilford for many years in the same compartment with my *Black*, or *Brown*, but *not* cinereous Spaniard. This last individual has for the last twelve or thirteen years regularly laid two or three well-coloured eggs annually, sometimes going through the form of making a nest, in which it was occasionally assisted by the late *Otogyps*, and by a Griffon Vulture (*Gyps fulvus*), which still survives. These three birds seemed to agree perfectly together, a happy fact, all the more remarkable from the coincidence that they are all (of late years elderly) females. The habits of my Castilian Vulture are most grotesque. When she fancies herself unobserved, she will suddenly pick up a stick and toss it repeatedly into the air, catching it more or less skilfully, and going through a sort of hopping dance with most ridiculous clumsiness and absurd contortions of the head and neck. This species is common in Andalucia, and may be called abundant in Central Spain, where it nests in the tallest Pine trees, both in the mountains, and less commonly in the plains. One or two eggs are generally laid, three occasionally: they are white, more or less thickly spotted and blotched with bright nut colour. In the great alluvial plains of the lower Guadalquiver, it is no uncommon sight to see a hundred or more Vultures of this species and the Griffon congregated with other birds of prey about a carcase; but in that part of Spain the latter is the most common of the two, as it certainly is in the northern provinces; whilst in the central provinces, the present species greatly preponderates in numbers, as it does also in the Island of Sardinia. My Griffon Vulture was taken from an insolated hill-side, I can hardly call it a cliff, at a short distance

from Irun in the province of Guipuzcoa, in the summer of 1887. We were staying at San Sebastian, and had discovered a large colony of Griffons in a range of cliffs at a short distance to the south-east, but the nests were inaccessible to us, and I could not induce a native to attempt a siege. On mentioning this to Mr. Edward March, who at that time filled the post of British Vice-Consul at San Sebastian, he informed me, that he believed there must be a Vulture's nest in the hills near Irun, as he had frequently observed two Griffons sailing over a particular valley at a few miles from that town, and as there were precipices the reabouts, he thought we might possibly get at the nest without any great difficulty. He kindly guided me to the top of a steep incline much overgrown with thick scrub. For some time before reaching this eminence we had observed two Vultures circling in the air, apparently much disturbed, and on peering over the edge of the acclivity, were soon aware of the cause of their anxiety, in the shape of a shepherd lad clambering amongst the rocks and brush wood at a short distance below us. We hailed him, and discovered that he had taken a young Vulture from the nest, and was making his way up to us. I gave him a peseta—tenpence—for the nestling, and with this modest sum, a handful of tobacco, and a cupful of wine, he went away delighted, invoking blessings upon us. On leaving San Sebastian a few days afterwards, I left the young Vulture at our inn under the special care of the daughters of the host; and on sending for it some weeks afterwards, as I returned to Paris and England by another route, my messenger assured me that, in spite of the ungainly appearance and rank smell of the bird, it had so won upon the affections of these kindly damsels, that they protested with tears and loud lamentations at being deprived of their pet. As a rule the Griffon breeds in societies of many pairs, in steep cliffs, and the instance just mentioned is the only one of an isolated nest that has come to my knowledge. This species, as I believe, seldom lays more than one egg, never more than two in a sitting. I have seen some specimens with more or less markings of pale tint colours, but they are generally of a spotless white. This Vulture is very abundant in the mountains of European Turkey and Greece, as also in Cyprus, Crete, Sicily, Sardinia, Tunis, and Algeria. My bird, probably owing to her early education, is very gentle and quiet, but objects strongly if her

keeper or any one else approaches the eggs laid by her or her companions.

I have two very fine specimens of the Bearded Vulture (*Gypaetus barbatus*), sent to me from two separate nests in the mountains near Malaga, in 1878. These birds are in magnificent plumage, and both *now* have snow white breasts: but one of them, in 1886, acquired a rich tawny colour on the lower plumage, which was lost at the next moult. The person in charge of these birds was convinced that this colour was produced by the bird's scuffling in the gravel of its compartment after washing; but as the other bird at Lilford went through exactly the same process without acquiring the same hue, or any trace of it, I am of a different opinion, though I am bound to admit, that on washing some of these tawny breast feathers with soap and water, the colour came away entirely. From the great size of my birds I believe them both to be females, but, till this year, neither has shown any inclination to sit. I heard in March last that one of them had scratched a hole in the gravel, and often sat in it, but no eggs were laid. These two birds on arrival at Lilford, and for some time afterwards, were perfectly tame, and would sit, one upon my shoulder, and the other on my knee, and, contrary to the habits of most raptorial birds, apparently much enjoyed being stroked and petted. They have now become much less confiding. One took to bullying the other, so that we were obliged to separate them: but I have never heard of their showing any ill temper or ferocity to their human attendants. They were both, for a considerable time, kept in the back shop of a bookseller in Malaga, where they lived in perfect amity with several children, puppies, one or two goat kids, and kittens. I have noticed this Vulture in almost every province in Spain that I have visited. A pair are generally to be found breeding in the neighbourhood of every establishment of Griffons, and when the latter birds have picked the bones of a carcase bare, the Bearded Vultures come down, and swallowing the smaller bones, carry off the larger into the air, and letting them drop from a great height upon the rocks, devour the fragments at their leisure. In the south of Spain, where Tortoises are common, these unhappy reptiles are treated in the same fashion as the marrow-bones by these birds, who, from this well-known habit, have acquired the common name of *Quebranthuesos*, *i.e.* Bone-breakers. The nest

of this species is generally placed in a hole or small cave in a precipitous face of cliff. The complement of eggs is two, but I am assured that it is very seldom that more than one young bird is hatched. Almost all the Spanish specimens of eggs of this species that have come under my notice are of a uniform reddish brown, but specimens from Eastern Europe seem, as a rule, to be of much lighter complexion, a pale pinkish cream colour being the prevailing tint. The Bearded Vulture generally lays early in January. I have heard of two slightly incubated eggs having been taken from a nest near Malaga, on December 26th ult.; but the shepherds of the southern sierras positively assert that the young bird never leaves the nest before June. I have good cause to believe this to be really the case, but am quite at a loss to assign any cause for this reluctance to quit the nursery. Though I have seen a good many of the present species in Spain, Sardinia, and Turkey, I never observed more than three together, and that number on one occasion only. I cannot believe the many stories that are told of lambs, kids, fawns, and children carried off by Lammergeyers, as these birds are frequently called; but I do quite believe that they would stoop at any of the animals just named on a ticklish ledge of rock, so as to cause it to fall and be killed, with a view to a future feast. The manner in which these birds hunt a valley for their prey has been so admirably described in the 'Ibis' by more able and experienced pens than mine, that I will not tax the patience of my readers by any attempt in that direction, but conclude my remarks for the present with some brief observations upon the Neophron, or so-called *Egyptian* Vulture (*Neophron percnopterus*), of which species I have two, now fully adult, specimens, obtained from Spain some years ago. These birds are full of petulance and what may very legitimately be called *cussedness*, and are for ever teasing the Kites, Buzzards, and Harriers that are kept in the same yard with them. The intention of these Neophrons appears not to be to inflict any damage, but merely to annoy the other birds by ousting them from any favourite resting-place. There is, to my eyes, something indescribably mean and repulsive in the expression of this species; but far be it from me to deny the value of their services to the human race in hot countries, as scavengers. No carrion, garbage, or ordure, comes amiss to them; and as they have naturally but little fear of man, their good works

in the undrained and unclean villages of Southern Europe can hardly be over-estimated. In Spain this species is exceedingly common as a summer visitor, generally breeding in low cliffs. I know of more than one instance of their taking possession of deserted nests of Kites in high trees. They lay two, rarely three, eggs, of a dirty white, thickly marked with dull red-brown. This species is a summer visitor to most parts of the Mediterranean shores, and breeds regularly in Switzerland.

II.

NOTES ON THE REV. F. W. GALPIN'S FLORA OF HARLESTON.

By H. D. Geldart, *Vice-President.*

Read 29th May, 1888.

Our President has asked me to say a few words to-night about Mr. Galpin's 'Flora of Harleston.' I do so very willingly, although it is difficult to say much where no opportunity offers for finding fault. It is very easy to criticise when there is plenty of pulling to pieces to be done, but unlimited praise is apt to become monotonous.

I have nothing but good to say of Mr. Galpin's work. It is well written, well arranged, well printed, and very cheap, altogether a very pleasant book to use. It is the record of observations of the Harleston Botanical Club, a club which deserves imitation in other towns in the County, in fact, if there were a few more such associations in Norfolk as well worked as this one, and whose records were equally reliable, we should in them possess an admirable County Flora.

There is one statement on page 30 with respect to the number of species in the British Flora which requires explanation. Mr. Galpin has taken the numbers printed in the eighth edition of the London Catalogue, issued in 1886, as an enumeration of species, having apparently overlooked the editor's disclaimer that "the Catalogue is not intended to be a critical authority as to which

plants are to be considered as species, sub-species, varieties and forms." This number, 1858, must, I think, be considered too high so far as species are concerned. The number of species given in the 'Student's Flora,' third edition, I make 1418. This was published in 1884, and there are about a dozen to be added for the two years' difference in time, this would make about 1430 species for 1886, and as there have been several new discoveries during the last two years, I think, on the basis of the 'Student's Flora,' which I regard as the best authority we have, about 1450 would be a fair estimate of species of British Flowering Plants, excluding Characeæ, known at the present time. To this number of 1450 we must add 25 for the Characeæ included in the 'London Catalogue,' so that a perfectly fair comparison between the two lists will be 1475 to 1878, or, as nearly as may be, 400 difference. It is easy to see how the discrepancy arises. Take genus Erythræa as an example: the 'Student's Flora' gives one species (*E. centaurium*) and four sub-species, but the 'London Catalogue' prints the whole of these five up to the line as if they were all species, and numbers them all on equal terms.

The district treated of in this Flora is, as we all know, situated in both Norfolk and Suffolk, and I have, so far as my knowledge of the localities goes, treated it almost entirely from the point of view of our own County.

Mr. Galpin's list adds at least two species as natives of Norfolk to the published records of our Society. These are *Primula elatior*, Jacq., the true Oxlip, and *Asplenium viride*, the Green Spleenwort. Mr. Dix most kindly went with me to Dickleburgh, and introduced me to the lady who first found the Oxlip, but we were not successful in finding it in flower. It seems to flower earlier than the other species of Primula, and was off flower by May 14th, the Cowslip and Primrose being still in full beauty. Of *Asplenium viride* it is enough to say that it has been known in one locality for nearly forty years; and if that locality is successfully kept secret, we may hope it will remain as long as the wall on which it grows stands.

The curious Maritime Flora to which allusion is made in the Introduction reminds us that, taken in connection with the seaside plants still holding their own at Brandon in the valley of the Little Ouse, there is every reason to suppose that Norfolk was, at no very long distance of time, really an island separated from Suffolk and

Cambridgeshire by an arm of the sea; practically, the county is insular still. Mr. Galpin places the springs from which the two rivers, the Wavency and the Ouse, rise at 300 yards apart, but I believe the two systems of drainage running East and West are divided only by a road a few yards wide. Mr. Galpin, following the 'Student's Flora,' describes *Corynephorus canescens*, the curious little seaside grass which has been found at Homersfield, seventeen miles as the crow flies from the sea, as an annual. This is not according to my own experience. The hard tufts of leaves from which the flowering stems rise on the Denes at Yarmouth are certainly many of them more than one year old. In this I am confirmed by Parnell, 'Grasses of Great Britain,' who says annual or biennial; and by Syme in 'English Botany,' third edition, who calls it perennial.

There are many surprises in Mr. Galpin's list, both in the presence of plants unexpected in such a district, and the total absence or rarity of others which one would certainly have supposed to be present, or not uncommon. Among the former are:

Anemone apennina	Veronica verna (extinct)
Dianthus armeria	Marrubium vulgare
Silene nutans	Apera interrupta
Oxalis corniculata	Corynephorus canescens
Hippocrepis comosa	Brachypodium pinnatum
Chrysosplenium alternifolium	Asplenium viride
Bupleurum rotundifolium	Ceterach officinarum
Galium tricorne	Cystopteris fragilis
Campanula latifolia	Equisetum hyemale

Conspicuous by their complete absence within the six-mile limit are:

Corydalis claviculata	Erica (both species)
Viola tricolor	Pedicularis palustris
Polygala serpyllacea	Epipactis palustris
Medicago falcata	Convallaria majalis
Poterium sanguisorba	(except as intro.)
,, officinale	Luzula maxima
Pyrus aucuparia	Scirpus cæspitosus
Drosera (whole genus)	Rhynchospora alba
Centaurea cyanus	Schœnus nigricans

Agrostis stolonifera	Molinia cærulea
Apera spica venti	Osmunda regalis
Deschampsia flexuosa	Botrychium lunaria

And the following, which one would have thought would be common, are very rare:

Viola palustris	Milium effusum
Saxifraga tridactylites	Asplenium adiantum nigrum
Parnassia palustris	Athyrium filix fœmina
Carduus pratensis	Lastrea dilatata
Calluna erica (one plant only)	

The scarcity of the commoner Ferns in this district is very curious. Mr. Galpin says of *Lastrea dilatata*, one of our commonest Norfolk Ferns, "very rare," and in our morning's walk at Dickleburgh the other day, I saw no Fern but *Lastrea filix mas*, and though I kept a sharp look-out for *Asplenium adiantum nigrum*, which in similar country to the north of Norwich would be almost certain to occur, I could not find it, and I understood my kind friend Mr. Dix, that he did not think a single plant of Brake (*Pteris aquilina*) would be found within a radius of two miles from his old residence.

In these notes I have not dealt with the appendix to Mr. Galpin's list, including plants found beyond the six-mile radius, for I think most of the localities in it are beyond our county, and therefore not of special interest to us as a Society. I do not intend to trouble you to-night with Mr. Galpin's additions to our distribution list. I have worked them out in readiness for the "List of Additions," which will, I suppose, be printed in the next number of our 'Transactions,' completing the fourth volume. Mr. Galpin has a long list of *Rubi*. On these I offer no comment, feeling convinced that, in the present state of knowledge of that genus, it is useless to do so. You may think this a harsh remark, but I can give you far better reason than only my own judgment for arriving at this conclusion. Mr. Arthur Bennett, whom I consider one of the best living authorities on British Botany, has just been publishing 'Notes on the London Catalogue' of genus *Rubus*, 416 to 476 (that is, sixty numbers remember). He says, "*Rubi*. I make no comment on these difficult plants, feeling assured that the arrangement and

nomenclature is only in a transition state," and I am quite content in this case to follow in his steps.

I hope that Mr. Galpin's removal from Harleston (he is at present in London) will not prevent the Botanical Records of the Harleston Club from being continued; even should this unfortunately be the case, any one who hereafter takes up the running where he leaves off, will have the great advantage of a firm and accurate foundation from which to start again preserved in this admirable little local Flora.

In conclusion, while regretting extremely Mr. Galpin's absence from our County, I wish him every success and happiness in his new career.

III.

DO THE BLACKBIRD AND THE THRUSH EVER INTERBREED?

(Supplementary Article.)

By Mr. Miller Christy.

Read 30th October, 1888.

About five years ago, through the kindness of Mr. J. H. Gurney, Jun., to whom I am again indebted, I was enabled to contribute to the 'Transactions of the Norfolk and Norwich Naturalists' Society' (vol. iii. p. 588) an article under the above title, in which I brought forward, classified, and criticised in detail no less than eighteen more or less satisfactory cases of supposed interbreeding between the Blackbird and the Thrush in a state of nature. The conclusion arrived at, as a result of this examination, was, that although the evidence was far from being as satisfactory and conclusive as could be wished, there was, nevertheless, reasonably good grounds for believing that such unions had occasionally taken place in a state of nature. Since writing the above-mentioned article, I have come across several other more or less reliable recorded cases of interbreeding, which seem to be of sufficient

interest to warrant their appearance in print in the shape of a brief supplementary paper. They are as follow :—

XIX. Mr. J. H. Gurney, Jun., has kindly called my attention to a case mentioned by Thompson ('Natural History of Ireland,' vol. iii. App. p. 456), who says that in the summer of 1849, a female Thrush and a male Blackbird paired and built a nest in a small shrub at Waterloo Cottage, near Ayr. In June, three young were produced. They were "parti-coloured, having some black spots, the size of a sixpence, on their breasts." Their note was unusual. Both parents fed them. These facts seem to have been supplied to Thompson by two eye-witnesses, whom he names.

XX. In 1859, Mr. Edward Newman, the then-editor of the 'Zoologist,' contributed to that magazine (vol. xvii. p. 6722) the following vague and unsatisfactory statement, that early in the spring of 1853 a dead Thrush (supposed to be a hen) was "found." It is not stated where or by whom. Next morning a Thrush's nest was found in a Laurel bush, and on this a Thrush regularly sat. Whilst so doing she was regularly fed by a cock Blackbird, but no hen Blackbird was seen. Young were eventually raised. After they had left the nest, the Thrush began to sing, and in time found another mate of her own species, and raised two more broods in the same garden that spring. The cock Blackbird and his mate lost so much time by these proceedings on the part of the former, that they were in a muddle all that spring. For rearing their first brood, they took possession of an old Thrush's nest of the previous year. Their second nest was very poorly constructed, and the third still worse. The latter contained only two eggs, of which but one was hatched. This record, which is by no means satisfactory in itself, must pass now for whatever it may appear to be worth. In any case, it is not strictly speaking a case of interbreeding, though bearing thereon.

XXI. The Rev. J. C. Atkinson, writing in the 'Zoologist' (vol. xvii. p. 6564), says, in 1859 he saw a Blackbird leave her nest in a hedge as he passed. On looking in he saw a typical, grass-lined Blackbird's nest, containing four typical and undoubted Thrush's eggs.

XXII. The Rev J. C. Atkinson, writing from Darby Parsonage, Yorkshire, on April 10th, 1875, says ('Zoologist,' x s.s., p. 4456) there was then in his garden a typical grass-lined Blackbird's nest,

to which his attention had been drawn by the actions of a bird of that species. It was built in some Ivy on a wall. Shortly after it was discovered, three unmistakable Thrush's eggs were laid in it, and these were duly sat upon by Thrush. Mr. Atkinson does not say whether the eggs were hatched or not.

XXIII. Mr. Philip H. Hadfield, of Moraston House, near Ross, Herefordshire, writes as follows in the 'Field' for May 1st, 1886 (p. 570):

"A Blackbird and Song Thrush recently took possession of the same nest, each laying therein (I believe in turns) three eggs. The eggs were, from accident, reduced to two Song Thrush's and one Blackbird's. The Blackbird then proceeded to sit on these, but, after a few days, deserted, owing to the noise of work carried on near the nest."

In a letter to me, Mr. Hadfield adds that the occurrence took place at Ross. The nest, which he believes was a Blackbird's, was built in some Ivy on some board palings.

XXIV., XXV., and XXVI. Mr. F. R. Fitzgerald writes ('Zoologist,' 1887, p. 194) that in April, 1887, he found in a Holly bush on the Sewage Farm at Harrogate a typical Thrush's nest containing four Blackbird's eggs, and from which a Blackbird flew. A neighbour informed him that one of his sons had met with a similar instance near the same place the previous year. A friend had also informed him that he had met with a similar instance in Nidderdale.

XXVII. Mr. J. Whitaker writes ('Zoologist,' 1887, p. 268) that in 1887 he found in a wood of 800 acres, where plenty of the usual lining material was obtainable, three Thrushes' nests, all containing eggs, and all lined with grass like Blackbirds' (instead of rotten wood). He had never, he says, met with similar Thrushes' nests before.

XXVIII. The following appeared in the 'Field' of June 16th, 1888:

"Interbreeding of Blackbird and Thrush.—On May 22, I found on the end of a low branch of a fine old Yew tree a nest, from which a Blackbird rose, and giving its noisy notes of alarm as it flew away; on looking into the nest I was surprised to find it contained two eggs, to all appearances Thrush's, as they in no way differ from a typical Thrush's egg. The nest is entirely composed of coarse and fine grasses, roots, small twigs, and moss, with only an attempt of a mud lining on one side, and which is almost hidden by the lining made up of the other materials of the nest.

The tree was in a secluded spot some distance from any thoroughfare, therefore it is not likely the eggs were placed in the nest by any one. I also found, on May 6, a Blackbird's nest with one egg of a clear light blue without markings. This variety of egg, mentioned by Mr. Saunders ('Manual of British Birds,' p. 14), may be the result of a cross between a Blackbird and a Thrush. I saw a pair of Blackbirds, which undoubtedly owned the nest and spotless egg, and to all appearance were true Blackbirds. Probably the nest with the Thrush-like eggs may more likely belong to such a cross.—F. W. Frohawk."

Here, then, are ten additional cases, in all of which there are more or less good grounds for supposing that Blackbirds and Thrushes have interbred. The evidence of their having actually done so is, however, both slight and unsatisfactory, as there are several suppositions on which it is possible to account for these supposed cases, without necessarily at once accepting them as authentic and reliable cases of interbreeding. Thus in the case of the first two (XIX. and XX.), it seems possible that a hen Blackbird, with her brown plumage and spotted throat, may have been mistaken for a Thrush by ignorant observers. Comparatively few persons, who are not professed students of ornithology, are aware that the hen Blackbird is not wholly and uniformly black, like the male. Several other instances, notably Nos. XXI., XXIV., XXV., and XXVI., may be cases of Blackbirds laying their eggs in the old and deserted nests of Song Thrushes. Similar cases among other species of birds, and especially among game birds, have been frequently recorded. For instance, Mr. T. O. Hall relates in the 'Field' for June 10th, 1876, "that a Missel Thrush built a nest in his garden and laid three eggs. Soon after he found two Blackbirds in the same nest. Upon these five eggs the Missel Thrush sat until they were hatched. The place at which this occurred is not stated."

I have long known that almost every bird will sit upon the eggs and rear the young of any other species laying eggs of somewhat similar size if they are introduced into her nest. As a result of a large number of experiments in this direction, I published an article "On the Result of Interchanging the eggs and young of different species of Birds," in the 'Journal of Proceedings of the Essex Field Club' for 1883 (vol. iii. p. xciv.). The following case, which I have clipped from the 'Essex County Chronicle' of May 25th, 1888, seems very much to the point :—

"Some days ago at Warley, three Blackbird's eggs were placed in a Thrush's nest, which already contained five eggs. All the eggs were hatched by the female Thrush, and the young birds were successfully reared, the nest being full to overflowing."

Case No. XXVII. seems a good deal like an instance of unaccountable variation in the nesting habits of the Thrush.

Cases Nos. XXII., XXIII., and XXVIII. look, however, very like good and reliable cases of interbreeding. As regards the first of the three, it may be remarked that the Rev. J. C. Atkinson is too good a naturalist to make any mistake between a Blackbird and a Thrush. The second of the three may possibly have been an instance of the two species laying in the same nest, but the third seems unobjectionable.

To sum up, it seems to me, as I have already said, that there are reasonably good grounds for believing the Blackbird and the Thrush to have occasionally interbred in a state of nature. It is quite true that some objection may be raised against almost every one of the cases brought forward, but, on the other hand, the cases cited are so numerous that it is unlikely that they are all spurious. As an old saying has it: "Where there is much smoke, there must be some fire."

Still the fact cannot be forgotten that not a single one of the twenty-eight supposed cases has come directly and personally under the notice of an ornithologist of unquestioned authority, and has been by him carefully observed and investigated. In almost every case the occurrence is reported second-hand.

Again, the absence, so far as I am aware, of any records of the occurrence in a state of nature of any individual birds supposed to be hybrids between a Blackbird and a Thrush is another damaging feature. Melanistic varieties, however, seem not uncommon among the Thrushes, and some of these may possibly be hybrids with the Blackbird. For instance, the Rev. H. A. Macpherson of Carlisle mentions ('Zoologist,' 1883, p. 377) an example of the Missel Thrush which had lived a year in confinement, and which had the breast and upper parts entirely black, while the wings were black, edged with buff.

Mr. J. H. Gurney, Jun., writes me that he has re-examined the bird alluded to in my former article (case No. XVI.), and gives

it as his opinion that it is a melanistic variety of the Missel Thrush, as also determined by Mr. Seebohm.

Mr. Gurney also says, that last February, Mr. Pycraft of Yarmouth showed him a Thrush which had got an almost black breast in confinement. The late Henry Doubleday of Epping had in confinement a Redwing, which turned perfectly black on moulting in the autumn of 1831.

Mr. J. Whitaker of Rainworth Lodge, Mansfield, writes ('Zoologist,' 1882, p. 151) that, on January 1st, 1881, a bird, supposed to be a Redwing, in a very curious plumage, was caught at Beeston, Notts. It was chiefly of a dark chocolate colour with black markings.

Mr. Joseph Clarke also informs me that on April 28th, 1839, a Fieldfare in very dark plumage occurred at Debden near Saffron Walden.

IV.

SOME OBSOLETE DISHES.

By Mr. W. H. Bidwell, Hon. Sec.

Read 30th October, 1888.

It may seem that the cuisine of the middle ages can have little to do with Natural History, but we know that the household books of great houses have furnished valuable information as to the fauna of the country at the time when they were written, and we shall find much to interest us in considering the manners of the middle ages with regard to food and to medicine.

Our forefathers, for the sake of variety and economy, included in their list of birds for the table many which are seldom eaten now, and not only did the rich thus store their larder with wild birds brought in by servants and tenants, but many an honest yeoman, like Sir Roger de Coverley's friend, would knock down a dinner with his gun twice or thrice a week, and by that means live much cheaper. Many strange dishes, whether of fowl or fish, were doubtless served at grand banquets simply to lengthen the menu, whilst

others, which are little esteemed now, were then considered great delicacies.

Early in the middle ages meat was generally boiled, because it was usual to eat it fresh-slain, the animal being killed and the joints transferred at once to the cauldron.

In the fourteenth century a more luxurious style of living was in fashion: not only were the joints roasted, but *made* dishes, and a great variety of small birds, were served with the different courses. It would appear that many at that time were of the same opinion as a late Dean of Durham, quoted by the Rev. William Rogers, who, while refusing to be called an epicure, said, that what he objected to, was a dinner without a bird.

Mr. Thomas Wright in his 'History of Domestic Manners in England' has given some bills of fare of this period, three of which I may quote to show the place in the menu which wild birds took at that time.

BILLS OF FARE—FOURTEENTH CENTURY.

FIRST COURSE.

Browet farsed and charlet for pottage.
Baked Mallard. Teals.
Small birds, Almond milk served with them.
Capon roasted with the Syrup.
Roasted Veal.
Pig, roasted, 'endored' and served with the yolk of his neck overgilt.
Herons. A leche. A Tart of Flesh.

SECOND COURSE.

Browet of Almayne and Viaunde rial for pottage.
Mallard. Roasted Rabbit. Pheasant. Venison.
Jelly. A leche. Urchynnes.
Pome de Orynge.

THIRD COURSE.

Boar in egurdouce and Maurmen' for pottage.
Cranes, Kid, Curlew, Partridge, all roasted.
A leche. A Crustade.
A Peacock endored and roasted and served with the skin.
Cockagris. Flaumpoyntes. Daryoles.
Pears in Syrup.

We see from the above that the hedgehog, though now supposed to be eaten only by gipsies, was then served at the tables of the great; the squirrel also was commonly eaten, and sometimes entered into the composition of "Browet farsed," the first named delicacy, which was a kind of Irish stew. A crustade was a raised pie of chickens, pigeons, and small birds.

After reading this list of extraordinary dishes, we can well understand how desirable it was that the "Doctoure of physyque" should "stand much in the kynge's presence at his meles, councellynge his grace whyche dyet is best."

The next bill of fare is for a moderate dinner of two courses in the fifteenth century, from the Sloane manuscripts in the British Museum.

FIRST COURSE OF NINE DISHES.

Long wortes. An hen in dubate.
Shuldres of Motoun.
Wylde Goos. Wode Doves.
Fresh Laumprey. Grete Codlynge.
Bonsomers. Tortons in paste.

SECOND COURSE.

Pynnonade.
Malardes of the rivere.
Cotes rost and Dampettes.
Quayles and Goldefynche.
Ele reversed. Breme de mere.
Frypours ryalle. Viande eu feast
Quarters of Lambe.

FOR ANOTHER DINNER.

FIRST COURSE OF ELEVEN DISHES.

Nowmbles of an Harte. Vyand ryalle. The syde of an Hert rostede.
Swanne with Chauderoun. Fesaunt rostede.
Bytore rostede.
Pyke and grete Gurnarde.
Haggesse of Almayne. Blaunche Custade.
A Sotelte, a blake bore enarmede with golde.

SECOND COURSE OF ELEVEN DISHES.

Gelé. Cream of Almond.
Kynd Kidde. Fillets of an herte endored.
Squyrelle rost.
Chykons ylarded. Partriche and Lark rost.
Perche and Porpoys rost.
Frytours Lumbard. Payne Puffe.
A Sotelté, a castelle of sylver with fanes of gold.

Here we notice the wonderful ornamental dishes called subtleties, the black boar enarmed with gold and the castle of silver with golden flags. The nowmbles or umbles of a deer, were the heart, liver, and lungs; and we learn from Mr. Harting ('Ornithology of Shakespeare') that from this word came the phrase, "to eat humble pie," as the umble pie was always given to inferiors and placed low down on the table.

In other bills of fare of this series we find among the birds—turtles, throstles, egrets, starlings, linnets, martinettes, cormorants, heathcocks, sheldrakes, and dotterel. Mr. Wright also refers to a French cookery book of the period, in which directions are given for cooking magpies, rooks, and jackdaws; and Mr. Southwell in his paper on the "Ornithological Archæology of Norfolk" (Trans. Norfolk and Norwich Nat. Soc. vol. i. p. 14) gives a list of the birds named in the household accounts of the Le Stranges of Hunstanton, in the sixteenth century, which includes the following—crane, plover,

curlew, bustard, bittern, heron, swan, wild goose, mallard, widgeon, teal, popeler (shoveller), coot, water hen, brant, woodcock, spowe (whimbrel), stint, redshank, snipe, knot, dotterel, sea dotterel, scapye, blackbird, pigeon, stock dove, and sparrow.

To speak more particularly of the wild birds which were brought to table in England in the middle ages, I may mention first the crane. This bird was a favourite dish with William the Conqueror, who on one occasion was so enraged with his dapifer, William Fitz Osborne, for serving a half-roasted crane that he struck at him.

The instructions given for serving a crane in the 'Boke of Kervynge, emprynted by Wynkyn de Worde at London, in Flete Strete, at the Synge of the Sonne, 1513,' and reprinted by the Early English Text Society, are as follows: "Take a crane and unfold his legges and cut off his wynges by the joyntes, then take up his wynges and his legges and sauce him with poudres of ginger, mustarde, vynegre, and salte." This was spoken of as displaying a crane. Our ancestors were careful to apply a different term to the carving of different birds, as "wynge that partridge, alaye that pheasant, mynce that plover, thye that woodcock.

The heron, called also hernshaw and heronshaw, from the French *heronceau*, was considered lighter of digestion than the crane, and in days when hawking at herons was considered "a marvellous and delectable pastime," was often brought to table. Dismember, was the term applied to the heron and egret, which birds were eaten with the same condiments as the crane.

Mr. Harting mentions the appearance of the heron at table at a feast given in the Hall of the Stationers' Company in 1812, for which there were provided six hernshaws and twelve godwits. Sir Thomas Browne speaks of "young herons being esteemed a festival dish and much desired by some palates," but of godwits he says, "accounted the daintiest dish in England, and I think, for the bigness, of the biggest price."

The bittern, or betowre, had "no sauce but salte." He was unjointed, and his flesh was said to resemble that of the leveret in colour and taste with some flavour of the wild-fowl.

The curlew and whimbrel, called also the "brewe," or half curlew, were unlaced, which term was also applied to the carving of the coney.

Knots, Sir Thomas Browne informs us, "being taken with nets

grow excessively fat, being mewed and fed with corn; a candle lighted in the room, they feed day and night, and when they are at the height of fatness they begin to grow lame and are then killed."

An interesting note on the mewing of ruffs and knots at Felbrigge appeared in our 'Transactions' (vol. iv. p. 393).

The dotterel, Dr. Fuller tells us, is "a *mirth-making* bird, so *ridiculously mimical* that he is easily *caught* (or rather *catcheth himself*) by his *over active imitation*. As the fowler stretcheth forth his *arms* and *legs* going towards the bird, the bird extendeth his *legs* and *wings* approaching the fowler till surprised in the net; but it is observed that the foolisher the *Fowl* or *Fish* (*Woodcocks*, *Dotterels*, *Codsheads*, &c.) the finer the flesh thereof" ('History of the Worthies of England, Lincolnshire').

All kinds of wild ducks were brought to table, and before being eaten were "unbraced."

The framers of the oath in "the charge for the mess-sergeants" in Norwich, in the reign of Henry VII., appear to have been in doubt where to class the flesh of wild fowl. Part of the oath as given by Blomfield is: "Ye shall also suffer no bakers to bye whete before X of the belle; no cook, no flesh, fyssh, no wilde foule, before IX of the belle, as the ordinance of this city is."

One writer tells us that "shovellers feed most commonly upon the sea coast upon cockles and shellfish," but "being taken home and dieted on new garbage they are nothing inferior to fatted gulls."

Mr. Stevenson, in his paper on Scoulton Gullery (Trans. Norfolk and Norwich Nat. Soc. vol. i. p. 24) says: "We have abundant evidence that in former times the young birds were taken in considerable numbers and met a ready sale in provincial and London markets." He quotes from the Northumberland 'Household Book': "It is thought good that seagulls be hadde for my Lord's own mees and none other, so they be good and in season," and from 'Grave's British Ornithology': "Formerly this bird (the black-headed gull) was held in esteem as an article of food, they were taken whilst young, before they were able to fly, by driving them into nets, and when fattened on offal were sold for the table at five shillings the dozen."

In 'Fuller's Worthies' we find mention of this practice of fatting gulls: "There is an island of some two hundred acres near Harwich, called *The Puit Island* from *Puits*, in effect the sole inhabitants thereof . . . . . Being young they consist only of

bones, *feathers*, and *lean flesh*, which hath a *raw gust* of the sea. But poulterers take them then and feed them with *grains* and *curds* (that is *physick* and *food*) the one to *scour*, the other to *fat* them in a fortnight, and their flesh thus *recruited* is most delicious."

Partridges and many other birds were formerly mewed and fatted for the table, and when wild birds were killed preference was given to those which had been snared or netted—a badly shot bird being much objected to. The snipe, or snite as it was then called, was much esteemed. An old poet selects this bird on account of its daintiness when ridiculing the want of perception of one who considered a duck equally good eating:

> "All oon to the a ffaucion and a kyghte,
> As goode an howle as a popingaye,
> A downghille doke as deynté as a snygte."

And all the small birds which could be shot with bow and bolt were in request, as well as the lark, the throstle, and the ousle. The mention of the last reminds us of the dish celebrated in nursery rhyme, when "four and twenty blackbirds were baked in a pie."

We must not think from these bills of fare that the wealthy were always feasting. Not only did the rules of the Church require frequent fasts, but great men often lived very quietly for a time, keeping secret house, as it was called, in an age when they could not go to France or Switzerland to recruit their health and their finances. For Lent and other fasts fish was in great demand, and perhaps on that account we find it less often than we should expect in the menu on other occasions. Those fish were prized which could be easily kept in stews or fishponds, used, as the first name shows, for stowing away for future use. Every monastery and hall had its fishpond, and the moats of old castles were used for the same purpose. Thus we read of the Franklin in the Canterbury Tales:

> "Full many a fat partridge had he in mew,
> And many a bream and many a luce in stew."

The termes of a kerver for fish were—chyne that salmon, splatte that pyke, sauce that tench, splaye that breme, tusk that barbell, culpon that troute, fin that chub, barbe that lobster, etc.

As to the choice parts, we are told "the head of a carp, the tail of a pike, and the belly of a bream, are most esteemed for their

tenderness, shortness, and well relishing. It was considered "that moist fish as eels, congers, lampreys, and shellfish were best broiled, rosted, or baked, but all other fish of a firm substance and drier constitution were rather to be sodden."

John Russell in his 'Book of Nurture' (Early English Text Society, No. 32) gives this direction:

> "Whale, swerde-fysche, porpoise, dorray, rosted well,
> Bret, samon, conger, sturgeon, turbot, and sele,
> Thornbak, thurlepolle, hound-fyshe, halybut to him that hath hele,
> All these cut in the dische as your lord eateth at meele."

Mr. Carew Hazlitt in 'Old Cookery Books' mentions the following fish as having been brought to table in the Fifteenth century: Sturgeon, skate, flounder, hake, haddock, codling, whiting, thornback, turbot, bream, roach, perch, gudgeon, miller's thumb, tench, and pike; and, he adds, "the whale was considerably brought into requisition for gastronomic purposes. It was found on the royal table as well as on that of the Lord Mayor of London. The cook either roasted it and served it upon the spit, or boiled it and sent it in with peas; the tongue and the tail were favourite parts." In early times the whale fishery was carried on for the supply of food yielded by its flesh, which was cut into slices and sold on the coast.

In 1264 Henry III. directed the sheriff of London to purchase one hundred pieces of whale for his table; and in the household expenses of Princess Eleanor de Mountfort, in 1266, is an entry, "Two hundred pieces of whale, 34s."

The porpoise, however, was brought whole into the hall, and carved or undertraunched by the officer in attendance. It was often cooked in oil and eaten with mustard, and was sometimes served with furmenty, almond milk, sugar, and saffron.

Sir Thomas Browne says of the dolphin, which many confounded with the porpoise, that the flesh was "more red, and, well cooked, of very good taste to most palates, and exceedeth that of porpoise."

We observe that the seal is put down in this list of fishes, and we also find mention elsewhere of the grampus, stockfish, cuttlefish, birt or brettcock, shrimps, whelks, and crayfish. To dress a crayfish these are the instructions: "Depart hym asonder and slytee the body and take out ye fyfshe, pare away the reed skynne and mynce

it thynne, put venegre in the dysshe and set it on the table without hete." Though the crayfish was not much esteemed he was thought to feed well. "The crevyce," we are told, "eteth the oysters and geteth them by policye, for when the oyster gapeth he throweth lytell stones in him and so geteth his fishe out for it bydeth then open."

The herring, salted and fresh, has been in high repute from the time of the Conquest. In the reign of Edward III. the sum of fifty marks was paid for five lasts of red herring for the royal household, and twelve pounds for two lasts of white herring. So important was this fish that in 1429, in the French war, a battle was fought to intercept a convoy of salt fish which was being taken to the English camp, which was known as the Battle of the Herrings. The corporation of Yarmouth was bound to furnish the king annually with a hundred herrings baked in four and twenty pasties; and the city of Norwich held the manor of East Carlton on condition of sending every year to Windsor a herring pie. In 1629 Lord Pembroke, and others, appointed to receive these pies at Richmond, found "divers just exceptions to be taken against the goodness of them; instead of a long hundred of six score they found only five score, and these not caused to be baked in good and strong pastye as they ought to be that they may endure the carriage the better" (Blomfield, vol. iii. p. 375).

In Cornwall similar pies were made with pilchards; one kind of pie, called the "starry, gazy pie," had the heads of the pilchards appearing through the crust as if gazing at the stars.

In the middle ages many English wild plants were grown in gardens for salads or for flavouring stews, and others which had medicinal virtues also found a place in cultivated enclosures, that they might be ready at hand in case of need or be preserved for future use.

Some lists of plants which were then considered desirable for a garden have been published, one by Mr. Wright in his 'History of Domestic Manners' (p. 300), from a manuscript in the Sloane Museum, which being very interesting and often referred to I will quote in full.

In these lists occur the names of many indigenous plants, and of others, which though not really wild in England, have so established themselves as to be included in the British Flora. Of these plants

several are still cultivated, but others have fallen into disuse. Their names bring to our minds pleasant pictures of cosy old ladies in quiet manor houses, busied in making conserves and cordials, or watching their drying bunches of simples.

A List of plants considered necessary for a garden, arranged in classes from a manuscript of the Fifteenth century in the British Museum—

Of Herbes for Potage.

Borage, langdabefe (buglos), vyolettes, mallowes, marcury, daundelyoun, avence, myntes, sauge, parcely, goldes (the corn marigold), mageroum (marjoram), ffenelle, caraway, red nettylle, oculus Christi (clary), daysys, chervelle, lekez, colewortes, rapez, tyme, cyves, betes, alysaundre, letyse, betayne, columbine, allia, astralogya rotunda, astralogia longa, bassillicum (basil), dylle, deteyne, hertestong, radiche, white pyper, cabagez, sedewale, spynache, coliandre, ffoothistle (probably sowthistle, although it is placed under the letter F in the alphabetical list), orage, cartabus, lympens, nepte, clarey, pacience.

Of Herbes for Sauce.

Hertestonge, sorelle, pelytory, pelytory of Spayne, deteyne, vyollettes, parcely, myntes.

Of Herbes for the Coppe.

Cost, costmary, sauge, isope, rosemary, gyllope, goldez, clarey, mageroum, rue.

Of Herbes for a Salade.

Buddus of stanmarche (the plant Alexander), vyolette flourez, parcely, red myntes, syves (cives), cresse of Boleyne, purselane, ramsons, calamyntes, primerose buddus, dayses, rapounses, daundelyoun, rokette, red netelle, borage flourez, croppus of red ffenelle, selbestryve, chykynwede.

Also Herbes to Stylle (Distil).

Endyve, rede rose, rosemary, dragans (the herb serpentine), skabiose, ewfrace (eyebright), wermode, mogwede, beteyne, wylde tansey, sauge, isope, ersesmart.

ALSO HERBES FOR FAVOUR AND BEAUTÉ.

Gyllofre gentyle, mageroum gentyle, brasyle, palma Christi, stycadose, meloncez, arcachaffe scalacely (Solomon's seal), philyppendula (dropwort), popy royalle, germaundre, cowsloppus of Jerusalem, verveyne, dylle, seynt Marc, garlek.

ALSO ROTYS (ROOTS) FOR A GARDYNE.

Parsenepez, turnepez, radyche, karettes, galyngale, eryngez (eringoes), saffrone.

ALSO FOR AN HERBERE.

Vynes, rosers, lyles, thew beries, almondez, bay trees, gourdes, date trese, peche trese, pyneappulle, pyany romain, rose campy, cartabus, seliane, colymbine gentyle, elabre.

In the above list, in addition to some flowers "used especially to decke the gardens of the curious," we note the following British plants, and probably there are others which we fail to recognize under the names there given them.

The COLUMBINE (*Aquilegia vulgaris*), the leaves of which were sometimes boiled in milk to relieve soreness of the throat, but which was probably cultivated rather for the beauty of its flowers.

CHICKWEED (*Stellaria media*). Which was eaten as a salad or boiled as spinach.

AVENS. The Herb-bennet (*Geum urbanum*), of which Gerard tells us that "if it be boyled with pottage or broth it is of great efficacie, and of all other pot herbes is chiefe not only in physicall broths but commonly to be used in all."

WILD TANSY (*Potentilla anserina*), the boiled roots of which are still eaten in the Hebrides, and which was formerly considered to have many good virtues against inward wounds.

VIOLETS. Gerard writes of violets: "Gardens receive by these the greatest ornament of all. Chiefest beauty and most excellent grace, and the recreation of the mind which is taken hereby cannot be but very good and honest for floures through their beauty, variety of colour and exquisite forme do bring to a liberal and gentle manly minde the remembrance of honestie, comelinesse, and all kindes of virtues. There is a syrup made of violets and sugar, whereof three or four ounces taken at one time soften the belly and purges choler, etc. The decoction of violets is good against hot

fevers. There is likewise made of violets and sugar certain plates called sugar violet or violet tables which is most pleasant and wholesome, especially it comforteth the heart and the inward parts."

Daisy. Probably Oxeye (*Chrysanthemum leucanthemum*), also called White Goldes. An old herbalist says, "the greater white daisie is a wound-herb of good respect, often used in those drinks and salves which are for wounds inward or outward."

Chervil (*Chærophyllum sativum*). A useful potherb rare in England.

Alexanders (*Smyrnium olusatrum*). Formerly used as celery is now.

Fennel (*Fœniculum officinale*), whose aromatic and carminative seeds comfort the inward parts. Fennel seed with sugar was sprinkled on cakes. The serving of the boiled leaves with mackerel appears to have been peculiar to the Eastern Counties.

Caraway (*Carum carui*). The carminative seeds of this plant, well known in confectionery, were considered "answerable to aniseseed in operation and virtues."

Scabious (*Scabiosa succisa*). The curiously shaped root of this plant suggested to our forefathers the idea that the enemy of mankind, jealous of its many virtues, sought opportunity to injure and destroy it.

Valerian (*Valeriana officinalis*), for this, I think, must be the plant intended by Sedewall, as it was often called Setewall, though that name is more correctly given to the Red Valerian (*Centranthus ruber*).

Tansy (*Tanacetum vulgare*). Gerard tells us that the root of tansy preserved in honey or sugar is an especial thing against the gout, if every day, for a certain space, a reasonable quantity thereof be eaten fasting. Also, "in the spring time are made with the leaves hereof newly sprung up and with eggs, cakes or tansies which be pleasant in taste and good for the stomacke." In the Sloane manuscripts is a recipe for tansy cake:

"Breke egges in bassyn and swynge hem sone,
Do powder of pepper thereto anone;
Then grynde tansay, the juse owte wrynge,
To blynde with the eggs without lesynge;
In pan or skelet thou shalt hit frye,
In butter wele skymm et wyturly.

Or white grece thou make take therto,
Geder hit on a cake, thenne hase thou do,
With plattere of tre and frye hit browne,
On brodeleches serve hit thou schalle
With fraunche-mele or other metis withalle."

Mugwort, Mogwede in the list (*Artemisia vulgaris*). Pliny saith, "That the traveller or wayfaring man that hath this herb tied about him, feeleth no wearisomeness at all, and that he who hath it about him can be hurt by no poysonsome medicines, nor by any wild beast; neither yet by the sun itself," and, adds Gerard, "Many fantasticall devices invented by poets are to be seen in the works of the ancient writers."

Wormwood (*Artemisia absinthium*). This bitter and aromatic herb is still appreciated by the drinker of early purl.

Dandelion (*Leontodon taraxacum*). Still used as a salad, a medicine, and a substitute for coffee.

The Sowthistle (*Sonchus oleraceus*).

Rampion (*Campanula rapunculus*). Called in the list rapounses, and there recommended as a herb for salad, for which the boiled roots were sliced and prepared with vinegar, the roots were also boiled and eaten with sauce.

The Buglos (*Echium vulgare*), the refreshing leaves of which were often mingled with those of the Borage (*Borago officinalis*), which was also a herb for the cup, and the young shoots of the latter were put into soups. An old writer says of borage: "Those of our time doe use its flowers in salads to exhilarate and make the mind be glad. It is used everywhere for the comfort of the heart, for the driving away of sorrow." The following also tersely expresses its virtue: "I, borage, bring courage."

The Eyebright (*Euphrasia officinalis*). Formerly much valued for improving the sight.

"Then purged with Euphrasy and Rue
His visual orbs, for he had much to see."

Culpepper says of it: "If the herb were but as much used as it is neglected, it would half spoil the spectacle maker's trade." The juice dropped into the eyes took away "darkness and dimness," and was also a "comfort to the memorie."

The Clary (*Salvia pratensis*). The Wild Clary (*Salvia*

verbenaca), also used for diseases of the eye, whence its name, "clear eye." In some cases the seed of wild clary was laid under the eyelid, to clear a film from the eye, which an old writer recommends as being safer than picking it with a needle. In cookery the plant was not only used as a flavouring for stews, but the leaves, taken dry, dipped in butter and then fried until they were crisp, "served for a dish of meate acceptable with manie, unpleasant to none."

Mint (*Mentha viridis*). "The smell of which rejoiceth the heart of man," and which was not only useful as a pot herb, but as a medicine to assist digestion.

Marjoram (*Origanum vulgare*). Used for making tea for rheumatic pains and for bruises.

The Germander (*Teucrium scorodonia*). A medicinal plant whose bitter leaves were much esteemed.

Red Nettle (*Lamium purpureum*), the leaves of which were pounded in a mortar and boiled in broth.

Betony (*Betonica officinalis*), an infusion of which was taken for colds and coughs, and which was said to cure forty-seven different disorders.

Nepte (*Nepeta cataria*). A tonic for the digestive organs.

Calamint (*Thymus calaminta*).

Vervein (*Verbena officinalis*). Vein-healing Vervein, as Spenser calls it. This aromatic herb entered into the composition of love philters, and the root worn about the neck was a charm for king's evil. Gerard says: "Many odde old wives' fables are written of Vervaine, tending to witchcraft and sorcery which you may reade elsewhere, for I am not willing to trouble your eares with reporting such trifles as honest eares abhore to heare."

Sorrel (*Rumex acetosella*), the juice of which was used in making verjuice and fever drinks, and the leaves eaten as a salad.

Persicaria (*Polygonum hydropiper*). The leaves of this plant, which has a burning taste, rubbed on the back or placed under the saddle were thought to refresh a wearied horse.

Aristolochia clematitis. This plant is not indigenous, but is found often where are ruins of nunneries. The only station recorded in Norfolk is Carrow Abbey (Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 107). It is a powerful emetic, and its roots were celebrated for their stimulating effects on the female constitution.

Pellitory (*Parietaria officinalis*). The mention, also, of pellitory of Spain, shows that this species is intended.

Mercury (*Mercurialis perennis*). Sir James Smith says: "Though poisonous, it appears from the accounts of ancient writers that it may be eaten boiled as a pot herb, if mixed with mucilaginous plants and oily substances." Ray relates a case in which a man, his wife, and three children suffered severely from eating it fried with bacon.

Chives (*Allium schœnoprasum*).

Ramsins (*Allium ursinum*). The value of this bulb is set forth in a proverb:

> "Eate leekes in Lide [March], and ramsins in May,
> And all the year after physicians may play."

Saffron. Of which all that can be said has been well said by Mr. Corder in his interesting paper (Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 21).

Galingale (*Cyperus longus*) and the Hart's-tongue (*Scolopendrium vulgare*).

Though not mentioned in the list, we know that Agrimony (*Agrimonia eupatoria*), which was formerly in great request for its medicinal properties, and Celandine (*Chelidonium majus*), a popular remedy for the cure of warts and certain diseases of the eye, were grown in gardens at that time, as was also Angelica (*Angelica archangelica*), which was valued as food as well as medicine; the leaf stalks were blanched and eaten as celery or candied for sweetmeats.

The names in this fifteenth century list which I have failed to identify are: Cartabus, Lympens, Selbestryve, Dragans, Herbserpentine, and Seliane; and there are two plants named about which there may be some doubt as to which species is intended, Eringez and Elabre.

We should hardly have thought that the Eryngo (*Eryngium maritimum*) would have been recommended for a garden, and though the candied roots were much prized as a sweetmeat, they were usually collected on the sea shore. Sir Thomas Browne says that some of his information about sea birds was derived from the eryngo gatherers. Gerard however tells us that he had both this plant and *Eryngium campestre*, which he did not know as a British plant, growing in his garden. The Sea Holly he brought for his

garden from Harwich, and from Langtree Point on the other side of the water. He gives directions as to the manner to condite Eringos. The roots having been boiled in "faire water by the space of foure houres till they be soft," were to be "pilled clean as ye pil parsneps," and the pith drawn out at the end of the root; they were then to be put into syrup made of sugar, white of egg and clear water, to which had been added a saucer full of rose water, and spoon full of cinnamon water and a grain of musk, and soaked and infused until the next day, when they were to be wrapped in paper with sugar and dried in a stove

Elabre. Mr. Geldart has kindly given me a note about Hellebore, but even with his assistance I cannot determine the plant intended. Mrs. Lancaster, in 'English Botany,' thinks that Hellebores were called generally by the name *Veratrum*; and in the index to synonyms to Gerard's Herball, we find "*Veratrum, id est, Helleborus*," and he calls White Hellebore "*Veratrum album*," describing it as a plant "with leaves like unto great gentian folded into plaits like unto a garment plaited to be laid up in a chest" which flourished in his garden. He also says: "It was reported unto me by the Bishop of Norwich, that White Hellebore groweth in a wood of his own near to his house in Norwich." Sir James Smith tells us in Rees' Cyclopædia that White Hellebore, so called from the colour of the root, was cultivated in this country previous to 1596 by Gerard, but he gives us no information as to when it was introduced.

The Black Hellebore (*Helleborus niger*) he tells us was unknown in this country until cultivated by Gerard. This is our Christmas Rose, and was also called *Melampodium*, because the daughters of Prætus, smitten with insanity by Bacchus, were restored to reason by the shepherd Melampus, who administered Black Hellebore as a purge. Perhaps this is only a poetic way of saying that the young ladies took to drinking, and when suffering from the effects of their insobriety, derived benefit from this medicine. Gerard considered a purgation of Hellebore good for mad and furious men, and those molested with melancholy. Mrs. Lancaster also alludes to the powerful action of *Helleborus niger*. "It is used by some venturesome quacks to cure worms in the body which it never faileth to do, when it killeth not the patient it would certainly kill the worm, the worst of it is, it will

sometimes do both." If the plant in the Sloane manuscript be not *Veratrum*, it must be one of the two English species, the Stinking Hellebore or Bearsfoot (*Helleborus fœtidus*) or Green Hellebore (*H. viridis*). Both are narcotic irritant poisons and very dangerous in the hands of unskilled persons. They were considered "goode against all the diseases whereunto Black Hellebore serveth."

The other herbs mentioned in the list, with the exception of those which, having been cultivated for centuries, could not be called wild, are plants from warmer latitudes, which found homes in the sheltered gardens of halls and monasteries.

In addition to the "divers physical herbes fit to be planted in gardens," there were herbs too many to refer to here, which were collected by those who searched woods and pastures or "went simpling on the flowery hills," and like the Widow Trueby distilled every poppy that grew within five miles of them. We have a hint as to the importance of this business in 'Merry Wives of Windsor,' where Falstaff says: "Come, I cannot cog and say thou art this and that, like a many of these lisping hawthorn buds that come like women in men's apparel and smell like Bucklersbury in simple-time."

To conclude: In this discursive paper on obsolete dishes I have endeavoured to gather together and serve up many instances, to show that Englishmen of the middle ages, unable, as we are, to fetch fresh fruit from every clime and canned meat from the Antipodes, yet made the best of the indigenous Fauna and Flora of the country to fill their larders and vary their bills of fare, and, in the words of Parkinson, "noursed up in their gardens many herbs to preserve health and to cure such small diseases as are often within the compass of the gentlewoman's skill."

V.

ADDITIONS TO THE LIST OF BIRDS OBSERVED ON THE KIMBERLEY ESTATE.

By The Earl of Kimberley, K.G., *Vice-President.*

Read 30th October, 1888.

The following additions to the list of Birds observed at Kimberley (vol. ii. p. 46) have been communicated by Lord Kimberley to the Norfolk and Norwich Naturalists' Society, and brings the number up to 148, but if, as is possible. the Grey-headed Wagtail was included in error, the number will stand at 147. Lord Kimberley does not now recollect his authority for admitting this species to the list.

Honey Buzzard (*Pernis apivorus*). Killed, July, 1888.

Marsh Harrier (*Circus æruginosus*). Seen several times by me, December, 1886 ; stayed here some weeks.

Short-eared Owl (*Otus brachyotus*). Seen by me, November, 1876.

Chiffchaff (*Phylloscopus rufus*). Common, accidentally omitted from the original list.

Purple Heron (*Ardea purpurea*). Bird of the year, killed near Hingham Semere, October, 1875.

Godwit (*Limosa lapponica?*). One seen in the summer of 1884.

Whimbrel (*Numenius phæopus*). Two seen by me, November, 1879.

Little Auk (*Mergulus alle*). Picked up dead, December, 1875.

Great Black-backed Gull (*Larus marinus*). Several seen by me, January, 1876.

NOTES.

A flock of five Sheld Ducks, which are very rare here, was seen on the lake in January, 1876.

The Goosander has visited us in unusual numbers of late. In

December, 1884, I saw thirteen together, several of them old male birds. They stayed here a long time. Every year since there have been several here, and always some old male birds. Last spring several stayed as late as May. Of course, I never molest them. They are much tamer than Wildfowl.

A Ring-tailed Eagle came here on October 6th, 1881; he was here all day mobbed by the Rooks. I watched him for some time.

Several Egyptian Geese appeared on the lake in 1883: in 1885 I saw eight together. They have bred more than once: this year they made a nest, but did not hatch off. I saw, one day, two of them perched high up on Oak trees. I conclude that the original birds had escaped from some private water, but do not know of any in this immediate neighbourhood.

The Lesser Spotted Woodpecker, formerly very scarce, is now frequently seen and breeds here.

A Grey Shrike was killed in December, 1876, and I saw another, or perhaps the same (though not in the same locality), in October of that year.

Peregrines are almost always here for some time in the winter.

The Black Tern, which is a rare visitor, was seen here in the spring of 1881.

The Red-backed Shrike bred on my home farm in 1876.

VI.

NOTES ON THE SECTIONS AT CORTON, SEEN DURING THE RECENT VISIT OF THE MEMBERS OF THE GEOLOGICAL CONGRESS.

By Clement Reid, F.L.S., F.G.S.

Read 27th November, 1888.

After the meeting of the Geological Congress in London last September, some of the members interested in Pliocene and Pleistocene Geology made an excursion to the Eastern Counties. During this excursion we were very liberally received at Corton by Mr. Colman, who had been at great trouble to clear extensive sections of the Forest-bed. The sections thus laid bare were of exceptional interest, and the erection of new sea defences make it doubtful whether the beds will again be so well seen for many years. Under the circumstances it was very desirable that so good an opportunity of examining the beds should not be lost; but, unfortunately, the time allotted to this part of the excursion was far too short to allow of detailed investigations on the spot. However, Mr. Colman very kindly offered to have any samples I might select sent to me in London for further examination. It is on the sections then seen, and on the specimens afterwards forwarded to me, that the following notes are based.

The beds exposed at the base of the cliff consist, for the whole distance examined, of carbonaceous clay, more or less laminated, and capped by a thin layer of compressed twigs and pieces of wood. A cursory examination of many of the larger pieces was made on the spot; but the wood was so much compressed and altered, that it seemed to be of little use to remove it. The determination of woods under these conditions is a task which I have not the time to undertake, and doubt whether the results would be

sufficiently exact to be worth recording. As far as could be made out, most of it belongs to Alder, Willow, Birch, and Pine (?).

Only towards the northern end of the exposure were any mollusca to be seen, and there, it is interesting to note, they were mainly *land shells*, and not aquatic forms. The absence of mollusca in other parts of the bed seems to be due to the decay of all calcareous fossils, and not to the original scarcity of these animals.

On the spot the beds did not look very promising, for a search of perhaps about half-an-hour only produced a single seed of Hornweed. However, a large block of the carbonaceous clay, and the overlying seam of lignite, was cut out and taken away for more minute examination. This examination has proved a more difficult task than I had expected; for the matrix was a somewhat intractable one, and before it was thoroughly disintegrated, the material had twice to be well dried, and twice boiled in a solution of soda for several hours. This process of boiling, though it sounds a violent method, is really the best one, and detaches the delicate fossils from the matrix with the least injury.

The thin bed of lignite seemed so distinct from the underlying clay, that it was carefully detached and treated separately. When washed and the residue examined, it proved, however, to be nothing but a deposit of twigs, seeds, and miscellaneous floating scraps, such as marks the high-water level of a flood at the present day. In fact, if we were dealing with the deposit of a modern flood instead of with one of very ancient date, the bed would be full of bottle corks and such like debris. The most common seeds were those of Alder and Hornweed; but as all the species occur still more abundantly in the bed below, it is unnecessary to give a separate list.

The underlying carbonaceous clay is snuff-coloured when dry, and splits readily into thin laminæ, but does not fall to pieces in water. The surface of the flakes was carefully examined for leaves, with the result that portions of the stem and leafy bracts of the Cotton Grass occur plentifully; but there was nothing else, except a single fragment of a dicotyledonous leaf, probably already skeletonized when it was imbedded. Scales of two or three species of fish were also noticed.

The next process was to boil down the fragments of clay till the matrix could be washed away, and all that was left was the twigs

and seeds, for not a single stone was met with. This proved to be a very troublesome business, as only a small amount could be treated at once. In fact this mechanical part of the work has taken so long, that there have not yet been time to finish the determination of the plants. However, the general results can be given.

Unlike most of the deposits near Cromer which I have examined for seeds, the Corton beds seem to have been deposited as flood loam, and not as true lacustrine clays. Aquatic plants are comparatively scarce, the common species being such as we should find on an Alder Carr. The Alder itself is very abundantly represented by cones and seeds; other trees are only recognised by driftwood. Cotton Grass and a species of Buttercup come next in abundance. Then follow the Hornweed, several Sedges, Pond-weeds, Bur-reed, and Atriplex.

The seeds are very much compressed, more so than is usually the case near Cromer. But this, and the greater amount of decay they have undergone, I take to be the result of the longer exposure to the weather in pre-glacial times. A seed sinking at once to the bottom of a lake suffers less than one exposed for a time to alternate flood and drought.

The determination of the plants is not yet complete, and there will evidently be two or three unrecorded Sedges to add to the Flora of the Cromer Forest-bed. However, the species, as far as known, are as follows:—

Ranunculus sp. Abundant.
Thalictrum flavum. Linn. One.
Atriplex patula. Linn. One.
Alnus glutinosa. Linn. Very abundant.
Ceratophyllum demersum. Linn. Abundant.
Sparganium ramosum. Curtis. Six.
Potamogeton lucens. Linn. Three.
„ trichoides. Cham. Abundant.
Zannichellia palustris. Linn. Two.
Scirpus pauciflorus. Lightf. Abundant.
„ lacustris. Linn. Rare.
Eriophorum angustifolium. Roth. Abundant.
Carex. Two or three species not yet determined.

The detached carpels of *Ranunculus* are very badly preserved, though so abundant. They are smaller than my recent or fossil specimens of *R. repens*, but the difference may be due to the decay of another layer. Even the characteristic and deep pitting is entirely obliterated on most of the specimens. They are also a good deal distorted by pressure.

VII.

NOTES ON THE FOOD OF SOME NORTH AMERICAN BIRDS OF PREY, COMPILED FROM THE REPORT FOR 1887 OF THE UNITED STATES GOVERNMENT DEPARTMENT OF AGRICULTURE.

By J. H. Gurney, F.Z.S.

Read 29th January, 1889.

The Department of Agriculture in the Government of the United States of America has recently issued an Official Report for 1887, which contains, in addition to other interesting matter, some curious statistics relating to the food of various Raptorial birds, as ascertained by dissection and tabulated by Dr. A. K. Fisher.

The following summary, compiled from this report, embodies the main facts thus ascertained; but it should be premised that, in numerous instances, a variety of prey was found to be contained in the stomach of a single Raptorial specimen.

It may be right also to quote the following statement in the words of the original report viz.: "The names of the animals found in the stomachs are given in general terms, such as mouse, mole, shrew; in nearly all cases (more than 99 per cent.) the exact species of each has been determined and recorded, and will be given in the final report."

With regard to the term "Rabbit," which frequently occurs, I may quote the following from Coues' 'Monograph of North American Rodentia' (p. 370): "Strictly speaking, the term Rabbit is

not applicable to any species of American Hare . . . . practically, however, the terms hare and rabbit in this country have become interchangeable . . . . though generally, perhaps, there is a tendency to restrict the name Hare to the larger species."

With regard to the term "Weasel," Dr. Coues is of opinion that the ordinary Weasel of North America is identical with that of Europe, and remarks: "The presence of true *Mustela vulgaris* on our continent may be considered established" (*vide* 'Coues' Fur-bearing Animals,' p. 104).

The great majority of the Raptorial specimens examined are recorded as having been obtained in the more Eastern States of the Union, and the comparative abundance, or the reverse, of each species, is incidentally illustrated by this record. In this point of view it is, I think, remarkable that the large and conspicuous Red-tailed Buzzard (*Buteo borealis*) appears to be by far the most numerous species of any on the list, and the number of these Buzzards examined (311) contrasts curiously with the fact of only four examples having been obtained of its near congener *Buteo swainsoni*.

In most parts of the world Kestrels are to be found among the more abundant of the Raptores, and the North American member of the genus, *Tinnunculus sparverius*, figures as the second most numerous species in the present list, as many as 133 having been dissected.

Strix pratincola, the North American subspecies of *Strix flammea*, has only supplied seven examples, indicating either that it is a much scarcer bird in the United States than the typical Barn Owl is in Europe, or that it is wisely protected in North America from the absurd and wanton persecution which so frequently befalls its representative in Great Britain.

The most numerous Owl on the list is the small species *Scops asio*, which bears in the United States the title of "Screech Owl." Of this Owl ninety-four specimens were examined, besides which it is remarkable that no less than six were found to have been devoured by other Raptores; viz., one by a Red-tailed Buzzard (*Buteo borealis*), one by a Red-shouldered Buzzard (*Buteo lineatus*), two by the formidable Barred Owl (*Syrnium nebulosum*), and, strange to say, two others by cannibalistic individuals of their own species.

Another and scarcer small Owl, the Saw-whet (*Nyctale acadica*) (so called from its note), had also, in one instance, become a victim of the Barred Owl's voracity.

It may be well also to refer to the fact of a Hawk (*Cooper-astur cooperi*) having been found in the stomach of an Eagle Owl (*Bubo virginianus*) killed in Texas. Another noteworthy record, under the head of Owls, is, the fact of a Burrowing Owl (*Speotyto hypogæa*) having devoured a "Prairie Dog," with which species of Marmot this small Owl has been supposed by some observers to live in harmony.

On a reference to the following notes, it will be found that, with the exception of the Swallow-tailed and Mississippi Kites, and also of the Mexican Falcon (all species of comparatively rare occurrence), every Raptorial species enumerated in this list has fed, more or less freely, on the smaller Rodents of the North American continent.

As regards other Mammals, a Bat has been found in one of the Kestrels examined; Shrews have been discovered amongst the prey of the North American Harrier, the Red-tailed, Red-shouldered, and Rough-legged Buzzards, and also of the Barn, Long-eared, Short-eared, Barred, and Eagle Owls; three species only have been found to contain Moles, viz., the Red-tailed and Red-shouldered Buzzards and the Barred Owl; five have captured Weasels, viz., the Goshawk, the Broad-winged and Rough-legged Buzzards, and the Barred Owl; the remains of Skunks have been found in the stomachs of the Harrier, the Red-shouldered Buzzard, and the Eagle Owl; and, lastly, a Red-shouldered Buzzard had succeeded in devouring an Opossum.

Reptiles (either Lizards, Snakes, Frogs, or Toads) were found amongst the food of all the species of the following genera:—*Circus*, *Cooper-astur*, *Buteo* (except *Buteo swainsoni*, of which only four were dissected), *Archibuteo*, *Tinnunculus*, also in *Syrnium alleni*, *Scops asio*, and *Speotyto hypogæa*.

Insects, frequently in considerable numbers, were found in all the species of the following genera, viz., *Elanoides*, *Ictinia*, *Circus*, *Accipiter*, *Cooper-astur*, *Astur*, *Buteo* (except *B. swainsoni*), *Archibuteo*, *Falco*, *Æsalon*, and *Tinnunculus*, also in the following species of Owls, viz., *Asio accipitrinus*, *Syrnium alleni*, *Scops asio*, *Bubo virginianus*, and *Speotyto hypogæa*.

"Craw-fish" are recorded as having been found in *Buteo borealis*

and *lineatus*, *Syrnium alleni*, and *Scops asio;* fish in *Buteo lineatus* and *Haliaetus leucocephalus*; and, lastly, Earthworms in *Buteo lineatus* and *B. pennsylvanicus*.

In the following summary the species examined are enumerated in the same order as in the original report.

(1) ELANOIDES FURCATUS (Linn.).

Swallow-tailed Kite.

(Five examined.)

Contents of Stomach.

In 2, Lizards
„ 1, "Tree-toad"

In 5, Insects (including in one instance sixty-nine Locusts)

(2) ICTINIA MISSISSIPPIENSIS (Wils.).

(One examined.)

Contents of Stomach.

Beetles.

(3) CIRCUS HUDSONIUS (Linn.).

North American Harrier.

(Forty-six examined.)

Contents of Stomach.

In 24, Mice
„ 6, Gophers (*Geomyidæ*)
„ 1, Red Squirrel
„ 1, Shrew
„ 1, Skunk
„ 1, Duck
„ 2, Fowls
„ 1, Woodcock

In 1, Quail
„ 6, Small Birds
„ 3, "Reptiles" (in two cases Lizards)
„ 8, Insects (in one case including seventy-one Locusts and ten other insects)

(4). ACCIPITER FUSCUS (Gmel.).

Sharp-shinned Hawk.

(Forty-eight examined.)

Contents of Stomach.

In 4, Mice
„ 1, Dove
„ 1, Quail
„ 1, "Poultry"

In 32, Small Birds (including one Swift)
„ 2, Insects

(5) COOPER-ASTUR COOPERI Bon.

Cooper's Hawk.

(Forty-six examined.)

Contents of Stomach.

In 1, Mice	In 14, Small Birds
„ 4, Pigeons	„ 1, Lizard
„ 8, Poultry	„ 1, Frog
„ 3, Quails	„ 2, Insects

(6) ASTUR ATRICAPILLUS (Wils.).

North American Goshawk.

(Six examined.)

Contents of Stomach.

In 2, Mice	In 1, Weasel
„ 1, Red Squirrel	„ 2, Insects
„ 3, Rabbits	

(7) BUTEO BOREALIS (Gmel.).

Red-tailed Buzzard.

(Three hundred and eleven examined.)

Contents of Stomach.

In 200, Mice	In 25, Poultry
„ 2, Rats	„ 4, Quails
„ 10, Red Squirrels	„ 1, Owl (*Scops asio*)
„ 7, Grey Squirrels	„ 5, Crows
„ 1, Chipmunk (*Tamias*)	„ 20, Small Birds
„ 1, Gophers	„ 3, Snakes
„ 11, Rabbits	„ 4, Toads
„ 16, Shrews	„ 4, Frogs
„ 3, Moles	„ 3, Crawfish
„ 6, Feathers	„ 22, Insects

(8) BUTEO LINEATUS (Gmel.).

Red-shouldered Buzzard.

(One hundred and two examined.)

Contents of Stomach.

In 59, Mice	In 1, Feathers
„ 2, Rabbits	„ 3, Toads
„ 11, Shrews	„ 9, Frogs
„ 3, Moles	„ 3, Lizards
„ 1, Opossum	„ 3, Snakes
„ 1, Skunk	„ 1, Cat-fish
„ 2, Small Birds	„ 3, Crawfish
„ 1, Dove	„ 41, Insects
„ 1, Poultry	„ 1, Earthworm
„ 1, Owl (*Scops asio*)	

(9) BUTEO SWAINSONI Bon.

Swainsoni Buzzard.

(*Four examined.*)

Contents of Stomach.

In 1, Mouse	In 1, Rabbit
„ 3, Gophers	

(10) BUTEO PENNSYLVANICUS (Wils.).

Broad-winged Buzzard.

(*Twenty-two examined.*)

Contents of Stomach.

In 3, Mice	In 3, Snakes
„ 1, Rat	„ 3, Toads
„ 3, Chipmunks	„ 2, Frogs
„ 3, Shrews	„ 10, Insects
„ 1, Weasel	„ 1, Earthworms
„ 2, Small Birds	

(11) ARCHIBUTEO SANCTIJOHANNIS (Gmel.).

St. John's Rough-legged Buzzard.

(*Twenty-eight examined.*)

Contents of Stomach.

In 23, Mice	In 1, Weasel
„ 1, Gopher	„ 1, Lizard
„ 1, Rabbit	„ 1, Insects
„ 1, Shrew	

(12) HALIAETUS LEUCOCEPHALUS (Linn.).

Bald Eagle.

(Six examined.)

Contents of Stomach.

In 1, Carrion
„ 1, Prairie Dogs (*Cynomys*)
In 4, Fish

(13) GENNAIA MEXICANA (Schleg.).

Mexican Falcon.

(*One examined.*)

Contents of Stomach.

"Prairie Hen."

(14) FALCO PEREGRINUS Tunst.

Peregrine Falcon.

(*Five examined.*)

Contents of Stomach.

In 1, Mice
„ 1, Feathers
„ 1, "Meadow Lush"
„ 1, Fowl
In 1, Duck, and also Beetles, which perhaps had been contained in the crop of the Duck

(15) AESALON COLUMBARIUS (Linn.).

Pigeon Merlin.

(*Nineteen examined.*)

Contents of Stomach.

In 2, Mice
„ 1, Swift
„ 9, Other Small Birds
In 2, Feathers
„ 7, Insects

(16) TINNUNCULUS SPARVERIUS (Linn.).

North American Kestrel.

(*One hundred and thirty-three examined.*)

Contents of Stomach.

In 55, Mice	In 25, Small Birds
„ 2, Gophers	„ 3, Feathers
„ 1, Rabbit	„ 3, Lizards
„ 1, Bat	„ 1, Snake
„ 2, Shrews	„ 1, Frogs
„ 1, Quail	„ 85, Insects

(17) STRIX PRATINCOLA Bon.

North American Barn Owl.

(*Seven examined.*)

Contents of Stomach.

In 3, Mice	In 1, Pigeon
„ 1, Rats	„ 1, Small Birds
„ 1, Shrews	

(18) ASIO AMERICANUS (Steph.).

North American Long-eared Owl.

(*Forty-seven examined.*)

Contents of Stomach.

In 40, Mice	In 1, Quail
„ 1, Rabbit	„ 5, Small Birds
„ 1, Shrew	

(19) ASIO ACCIPITRINUS (Pall.).

Short-eared Owl.

(*Forty-five examined.*)

Contents of Stomach.

In 34, Mice	In 1, Feathers
„ 1, Gopher	„ 3, Small Birds
„ 1, Rabbit	„ 7, Insects (in one instance 30 locusts)
„ 1, Shrew	

(20) SYRNIUM NEBULOSUM (Forst.).

Barred Owl.

(*Thirty-seven examined.*)

Contents of Stomach.

In 16, Mice
„ 1, Red Squirrel
„ 1, Flying Squirrel
„ 3, Rabbits
„ 1, Shrew
„ 1, Mole
In 1, Weasel
„ 1, Fowl
„ 3, Owls (one *Nyctala acadica* and two *Scops asio*)
„ 1, Small Birds

(21) SYRNIUM ALLENI Ridg.

Florida Barred Owl.

(*Four examined.*)

Contents of Stomach.

In 2, Mice
„ 1, Lizard
„ 1, Frog
In 1, Crawfish
„ 1, Insects

(22) NYCTALA ACADICA (Gmel.).

Saw-whet Owl.

(*Six examined.*)

Contents of Stomach.

In 6, Mice

(23) SCOPS ASIO (Linn.).

North American Screech Owl.

(*Ninety-four examined.*)

Contents of Stomach.

In 41, Mice
„ 4, Feathers
„ 1, Pigeon
„ 2, Owls (*Scops asio*)
„ 13, Small Birds
In 1, Frog
„ 3, Crawfish
„ 26, Insects (in one case, fifty locusts and sixteen other insects)

(24) BUBO VIRGINIANUS (Gmel.).

North American Eagle Owl.

(*Thirty examined.*)

Contents of Stomach.

In 1, Mouse
„ 5, Rabbits
„ 1, "Fox-Squirrel"
„ 1, Grey Squirrel
„ 1, Gopher
„ 1, Shrew
„ 2, Skunk
„ 1, Weasel ?

In 2, "Ruffled Grouse"
„ 1, Quail
„ 10, Poultry
„ 1, Pigeon
„ 2, Small Birds
„ 1, Hawk (*Cooper-astur cooperi*)
„ 2, Insects

(25) NYCTEA SCANDIACA (Linn.).

Snowy Owl.

(*Six examined.*)

Contents of Stomach.

In 1, Mouse
„ 1, Rat

In 1, "Prairie Hen"

(26) SURNIA FUNEREA (Linn.).

American Hawk Owl.

(*One examined.*)

Contents of Stomach.

Mouse

(27) SPEOTYTO HYPOGŒA (Woodh.).

North American Burrowing Owl.

(*Ten examined.*)

Contents of Stomach.

In 2, Mice
„ 1, Prairie Dog
„ 1, Lizard

In 10, Insects (in one case, fifty-nine locusts and three other insects)

VIII.

THE THRUSH TRIBE IN ENGLAND.

By J. H. Gurney, Jun., F.Z.S., *President.*

Read 29th January, 1889.

The Thrush tribe are placed by modern systematists at the head of our list of British Birds, and it would be difficult to find fault with an arrangement which commences with a genus so typical. They belong to the family *Turdidæ*, of the order *Passeres*, and sub-order *Oscines*.

Mistletoe Thrush, *Turdus viscivorus*, Linn.

The Mistletoe Thrush is found all the year in England, and is much commoner than it used to be, according to the testimony of everybody, and what everybody says must be right! It has become commoner in Norfolk. I remember one very exceptional year when there were more Mistletoe Thrushes' nests about Cromer than Blackbirds', a state of things which would have astonished the immortal Bewick!

In Norfolk this bird is commonly called a *Fulfer*, literally meaning a *farer* over *fields* or *fallows*; and sometimes an unusually discerning rustic will call a Mistletoe Thrush a *Dow-fulfer*, meaning that in its large size and light colour it resembles a Ring Dove. The true Fieldfare is also a *Fulfer*, and I have many a time heard the name applied to the Redwing too, for our country-folk are not very discriminating in their Natural History; but the name belongs by right to the Fieldfare, and is misapplied to any other species.

In regard to the food of this bird, Professor Newton, to whose help I am greatly indebted, assures me that in the garden of Magdalene College, Cambridge, where there are many apple-trees, until lately thickly overgrown with mistletoe, he has for more than five-and-twenty years observed the zest with which the mistletoe-berries are eaten by Mistletoe Thrushes, and moreover that these berries seem not to be ordinarily touched by any other bird. Professor Newton tells me that on one occasion he saw a mistletoe-berry taken by a Redbreast; but on the other hand he has seen a Blackbird, apparently in the last extremity of famine, sit with a mistletoe-berry not half-a-dozen inches from

her bill, and yet make no attempt to pluck it. An apple-tree covered with mistletoe grows exactly opposite and within ten yards of the window of the room at which he constantly sits to read or write, and hence he has exceptional opportunities of observing all the birds that come to it. The berries are seldom or ever sought until the end of January or the beginning of February, and it is a pleasant sight, he remarks, to watch the Mistletoe Thrushes pluck one berry after another in a deliberate way, stopping, after each is swallowed, as though to enjoy its taste, just as a man who knows what good wine is, and has a glass of it, deliberately takes it a sip or a mouthful at a time and dwells upon its flavour. The visits to the mistletoe-bushes seldom last long, but are repeated; for it would seem that the same birds return several times in the course of the day, until nearly the whole crop is gathered; the berries growing low down excepted, though if the weather is severe even these are in time plucked. Professor Newton writes me, that during the past winter, 1888–89, which, until nearly the middle of February was comparatively mild, he saw no Mistletoe Thrushes in the garden of his college until the 11th of February, and had begun to wonder what would become of the mistletoe berries of which there was a profusion on the apple-trees immediately opposite his window. On the afternoon of the day just mentioned, however, everything being under deep snow, a pair came to the tree and began in their usual way plucking berry after berry; but they did not stop many minutes, as it happened that two or three people passed on the path close by, and the birds are always shy, even where no molestation is ever offered to them. About three hours later they returned and then stayed longer, pulling off nearly all the berries within easy reach, and even those that they had to jump for and take on the wing.

The range of the Mistletoe Thrush extends all over Europe. I met with it at Moscow and St. Petersburgh, but at Heligoland was told by Herr Gätke that it was the least abundant of the six regular migratory Thrushes which visit that island. Krœner and Fournel say it is a summer migrant in Alsace; but I saw one at Nancy in January, and have little doubt it is found in France at all seasons. The down of the nestling is much whiter than in the Song Thrush, and in the same nest there will sometimes be nestlings of different sizes. The nestling can see on the fourth day.

THRUSH, *Turdus musicus*, Linn.

This universal favourite, in the judgment of Martial, is the best meat of all birds, being among the feathered creation what the hare is among quadrupeds. At the present day this judgment is certainly not disputed at Berlin and Brussels, where the poultry markets are full of them, as well as at other towns on the Continent which I have visited. In Heligoland may be seen barricades of bushes artfully constructed with a net behind, about twenty feet by twelve, in which numbers are captured, and there, in the migratory season, the islanders must almost live on Thrushes and other kinds of birds, which form a staple article of diet; and fortunate it is for them that they have such food to fall back upon in time of scarcity, when rough seas cut off their weekly supplies from Hamburgh. The result of all this is, that, on the Continent, Thrushes avoid the society of man, and very rarely come near towns,[1] whereas in England they are the tame and protected denizens of every garden. Yet they are everywhere common, and the quantity which are snared abroad does not seem to make much difference in their numbers, each returning season bringing with it its fresh supply.

In October our home-bred Thrushes go south, and in November we receive an immense number of migrants from the north. Most of these come over the sea, and several ornithologists have considered that they come from Heligoland; some may do so, but in the writer's opinion, the majority come from Norway. In 1883 there was a rush simultaneously on our east coast and in Heligoland, but even then they appeared three days earlier in England.[2] But this matter has been treated of before in our 'Transactions,'[3] and therefore need not be dwelt on again.

The first nest in the shrubbery is sure to be a Thrush's, though it is not uncommon for them to nest on the ground, and it is marvellous how smooth they can make the inside with a coating of mud, which soon become water-tight, and which Seebohm says they mould into a round form with their bodies.[4] My father, in a communication to the 'Zoologist,' has noted a nest in which this inside coating was entirely absent; and Mr. Whitaker found three such mistakes, if they may be called so, in one wood[5] and all

[1] Keulemans' 'Cage Birds,' p. 72.
[2] Report on Migration, p. 35.
[3] Vol. iv. p. 52.
[4] 'British Birds,' p. 218.
[5] 'Zoologist,' 1887, p. 268.

containing eggs. April is the usual time for laying, but I have found eggs as early as February 28th, and as late as October 14th. One well-known sight of the Country Naturalist's walk is the Thrush's "chopping block," a stone bedaubed with slime and the fragments of snail shells, around which are commonly the remains of from two to fifteen of the pretty banded Wood Snail. But although this from the delicate texture of its shell is preferred by the Thrush, it can break the thick covering of a Whelk when need be, strange as it may seem.[1] If the Thrush is disturbed at its work, and the snail-shell is not much broken, its occupant can mend it again.[2] I have seldom seen a Thrush's stone with any chink, in which a snail could be pinned, but my father is able to confirm the observation of St. John that some fix the shell and break it up.[3] Worms are the Thrush's chief prey, and as in the garden, and especially in seed-beds, worms are injurious, they do good in destroying them. Of course they are inveterate fruit-eaters in the season, and often get caught in the gooseberry nets, but they are not quite so bad as Blackbirds; and I know a gentleman who kills all the Blackbirds in his garden but will not touch a Thrush, a distinction which has more in it than at first sight appears.

Pied and white Thrushes are too common to call for remark. Messrs. Gray and Cordeaux have dwelt on the dark colour of some of the Thrushes in Lincolnshire and the Hebrides, and I have often noticed that newly arrived migrants at Cromer and Cley in the autumn look small and dark when on the wing, but much is due to the character of the surroundings. Lewin figures a variety with a black eye-mark.[4] Thrushes which are partial melanisms are also not uncommon in confinement, arising from an unnatural diet, but I never read or heard of a wild one which was a melanism. Blue unspotted eggs are not uncommon, but it is quite a mistake to suppose that such eggs produce pied or drab-coloured birds, a popular idea which is unsupported by any scientific observations.

Redwing, *Turdus iliacus*, Linn.

The Redwing comes to us from the northern parts of Europe, and is a regular and numerous winter visitant, coming in October

[1] Macgillivray, 'British Birds,' vol. ii. p. 134.
[2] 'Birds of Middlesex,' p. 31.
[3] 'Natural History in Moray,' p. 107.
[4] 'Birds of Great Britain,' vol. ii. p. 68.

and leaving the British Isles in April. Their numbers vary, and a superabundance of hips and haws is no indication whatever that Redwings will be plentiful. Should the ground be rendered hard by frost, great numbers die, while others maintain a lingering existence in the vicinity of the sea where there is less frost. It is astonishing with what expedition they clear off the few remaining berries; three or four will stick to a holly bush until every berry is gone. At these times many of them become nothing but bags of bones weighing 1½ oz. or even less.

Mr. Seebohm thinks that at ordinary times it is not a great berry feeder, but Mr. Smith dissents,[1] and several observers have noticed the Redwing's fondness in autumn for the Mountain Ash, a very tempting food to a great many species of birds on their arrival from the Continent. Many will corroborate Mr. J. Sclater when he says they waste their berries, for he is quite correct in remarking that they throw nearly as many to the ground as they eat,[2] where they speedily become too hard to be any longer eatable, at all events by the Thrush tribe. Mr. Cordeaux[3] and Dr. Bull[4] have proved that the Redwing will break snail-shells on a stone like the Thrush, using it as a "chopping-block" against which to hammer them: but this is not a common habit, and does not seem to have fallen under the notice of many persons. Whether the Redwing ever nests in Britain or not has been hotly debated, as have two other points in its economy, viz., whether it comes before the Fieldfare or after, and whether it sings in this country. The question of singing is now quite settled in the affirmative,[5] and it seems impossible that none of the cases recorded of its nesting, which are very numerous, should be authentic. Four or five different people are said to have found the nest in Yorkshire,[6] and one was actually killed in Kent sitting on four eggs in a holly bush.[7] I was told, on what seemed good authority, that it had bred at Castle-Eden dene in Durham, and it is also said to have nested in Tipperary, North Wales, Perthshire, Leicestershire, Surrey, Hertfordshire, The Hebrides,[8] and Middlesex.[9]

[1] 'Birds of Somerset,' p. 66.
[2] 'Zoologist,' 1876, p. 4818.
[3] 'Zoologist,' 1865, p. 9534.
[4] 'Birds of Hereford,' p. 5.
[5] 'Zoologist,' 1880, p. 382.
[6] 'Zoologist,' 1845, p. 1086; 1873, p. 3411; 1879, p. 460; 1885, p. 435.
[7] 'Zoologist,' 1886, p. 369.
[8] Fleming, 'British Animals,' p. 65; 'Field,' April 28th, 1888
[9] 'Magazine of Natural History,' 1837, p. 440.

The nest in North Wales rests on the excellent authority of the late Dr. Saxby,[1] but a well-known Ornithologist who saw the eggs thinks they were Blackbird's. None the less Saxby's authority was first-rate, and in his diary (*l.c.*) he has left us a complete account of what he saw.[2]

THE FIELDFARE, *Turdus pilaris*, Linn.

The Fieldfare arrives in this country from the shores of Norway, crossing the sea in scattered flocks, which probably take their departure from between Bergen and the Naze: as soon as they touch land they begin to scatter over fields, and parks, and pastures in search of worms and snails, and when they find a good place they stick to it. One of the largest arrivals ever seen was on the 28th of October, in Lincolnshire,[3] and another great visitation is described by Mr. Cordeaux on November 30th, 1868.[4] That they should appear on the east coast of England in great quantities, is perhaps not so remarkable as that they should frequent the New Forest in "almost incredible numbers," as Mr. G. B. Corbin says is sometimes the case[5] when attracted by a good supply of berries. But this is when snow and hard weather drive them south, I imagine, and there are no longer many places where they can find any food. October is the month in which the Fieldfare usually comes, but one was seen in Norfolk by Mr. Purdy as early as September 1st, and another in my possession was shot on the 17th of September at Boyland. An odd Fieldfare is occasionally left behind when the others depart north, and laggards have been shot or identified in July in Leicestershire, Kent (2), Middlesex, Northamptonshire and Yorkshire, while two have occurred in Norfolk in June, and several in Nottinghamshire.

In Barrington's 'Miscellanies' the author states that he had heard of a nest near Paddington (p. 219); and Mr. Blyth has recorded one near London,[6] about which he more than once expressed

[1] 'Birds of Shetland,' pp. 64, 386.

[2] It has probably never nested in Norfolk, though said to have done so in a communication to the 'Eastern Daily Press' (September 13th and 20th, 1888), and in some notes of Sir William Hooker's communicated to Mr. Stevenson ('Birds of Norfolk,' vol. i. p. 31). Many years ago my father was informed that a pair nested at Attleborough.

[3] Seebohm, 'British Birds,' vol. i. p. 230.

[4] 'Zoologist,' 1869, p. 1543.

[5] 'Zoologist,' 1876, p. 4872.

[6] 'Magazine of Natural History,' 1839, p. 467.

himself positive.[1] We have also supposed instances of its nesting at Huddersfield,[2] and York,[3] in Lancashire, in Hants,[4] in Kent, Selkirkshire,[5] Aberdeenshire,[6] and Sutherlandshire,[7] and in Suffolk,[8] and certainly it seems hardly fair to the recorders to assume that they are all mistakes. Prolonged frost always drives Fieldfares to great extremities. At these times they seek the turnips, and it is extraordinary what holes they dig in them; and I have known them sometimes consume nearly half a large turnip unaided by any other bird; but this has been when the turnips have been scattered for sheep. They prefer these because they are often partially eaten or rotten.

The Fieldfare breeds in colonies in the northern Palæarctic regions, moving south in autumn, at which season it is well-known to the inhabitants of Heligoland. Gätke says, countless flights appeared there in January, 1878, and it was at this very time that their great scarcity was noticed in Lincolnshire by Mr. Cordeaux.[9] They are considered a delicacy in Germany, of which I have seen abundant evidence in the market at Berlin. 1,395,702 Fieldfares are given in a single year's "Returns of Game" by the Bureau of Statistics in that city, but it is to be presumed that it includes all other Thrushes in this huge total. H. L. Meyer gives an account of the way in which they catch them worth reading.[10]

Blackbird, *Turdus merula*, Linn.

The Blackbird is a favourite with very class in the community. Its attractive appearance was not overlooked by our great poet Shakespeare. In the well-known line in Midsummer Night's Dream he says:

> "The owzel-cock, so black of hue,
> With orange tawny bill."

Perhaps Shakespeare did not describe an adult bird, but Drayton

[1] *Cf.* 'Field,' June 17th, 1871; 'Birds of Europe,' vol. ii. p. 46.
[2] 'Yorkshire Naturalists' Transactions,' vol. ix. p. 75.
[3] 'Field,' May 26th, 1888. [4] 'Zoologist,' 1869, p. 1864.
[5] 'Magazine of Natural History,' 1837, p. 339.
[6] 'Field,' Dec. 5th, 1874; 'Natural History Society of Glasgow,' 1876, p. 177.
[7] 'Tour in Sutherland,' vol. i. p. 206. [8] 'Birds of Suffolk,' p. 50.
[9] 'Zoologist,' 1878, p. 243. An indication that they do not come to our shores *viâ* Heligoland.
[10] 'British Birds,' vol. ii. p. 12.

did when he speaks of "The Woozel" which "hath a golden bill," for in an old cock it is quite yellow, and contrasts splendidly with the plumage.

So many may be sometimes turned out of a small plantation or a field of swede turnips or mangolds, that I look upon the Blackbird as a gregarious bird in Norfolk in autumn. It is one of the hardiest of its tribe, and will often brave the rigours of winter when Fieldfares and Redwings are dying: but Thompson gives an instance of its succumbing at last.[1] Many observers have testified that they have the Thrush's habit of dashing snails against a stone; but Blyth thought they did not properly understand the process, as he found them make a bungle of it when caged;[2] and this method of obtaining food is undoubtedly far more characteristic of the Song Thrush, though it may be occasionally practised by all of the tribe. In captivity they will eat the naked slug,[3] which is much more remarkable, as few birds will touch such a slimy morsel. The Blackbird is common in Algeria, and a few visit Egypt in winter. Mr. Worthington shot three there; but I never met with it, except two in cages, and will not be sure that they had not been imported. No birds seem to be so often pied with white as Blackbirds, and this lack of colour is oftenest about the head. I had a pied one in my garden near Cromer for three years, but it migrated every winter, and at last left us never to return, much to my regret, as it would occasionally come up to the dining-room window to be fed. It got decidedly more pied as it became older, and when last seen was about two-thirds white. A really pure white Blackbird is a rarity, but white Blackbirds are not invariably albinos. Mr. T. E. Gunn had a white one with pinkish legs and toes, and yet it was not a true albino, because the beak and eyes were of the normal colour.[4] The converse is still rarer, viz., a variety with pink eyes and yet with plumage not pure white: such a Blackbird was obtained at Newdigate, near Reigate, in August, 1888, and I had the pleasure of seeing it. The pattern of the breast-spots was plainly visible in buff. Males are oftener pied than females.

[1] 'Birds of Ireland,' vol. i. p. 147.
[2] 'Magazine of Natural History,' 1834, p. 243.
[3] 'Field,' May 21st, 1881.
[4] 'Zoologist,' 1876, p. 4787.

RING OUZEL, *Turdus torquatus*, Linn.

In the southern and eastern counties of England, the Ring Ouzel is essentially a spring and autumn visitant, but in Scotland it is a summer visitant, and has nested at least once in the Orkneys.[1] It is also pretty common at that season in Ireland and Wales. Not a few nest in Northumberland and Cumberland, in Lancashire,[2] and in Yorkshire.[3] Mr. Evans long ago recorded some nests in Warwickshire and Leicestershire.[4] Mr. Briggs says it breeds in Derbyshire,[5] and Whitaker and Sterland give one instance for Notts. It is believed to have nested several times in Suffolk, one of the earliest cases being recorded by my father in 1849. The Earl of Kimberley has stated in our 'Transactions' his conviction that a pair nested at Kimberley,[6] and some other supposed instances in Norfolk are alluded to.[7] Mr. Wallis gives an instance for Essex;[8] and some nests are on record in Kent.[9] It breeds in Cornwall, Devonshire and Somersetshire, and occasionally in Wiltshire, also in Shropshire and Herefordshire; and Mr. Booth has evidence of a nest in Sussex in 1865.

I have on one or two occasions heard of a good number on the east coast, though seldom seeing more than one at a time. A great gathering took place on the south coast in the autumn of 1849, when Mr. G. B. Ellman reported in the 'Zoologist' an astonishing number passing through Sussex: large flocks were seen continually on the downs for a month, and no one ever recollected so many before.[10] But these are exceptional movements, for on migration it is generally met with in small flocks, sometimes five or six, sometimes a score, straggling a long distance over a furzy down or a rough common, or it may be some pasture land.

It was formerly supposed that only one occurrence of the Ring Ouzel in winter was on record;[11] but this is now known to be by

[1] 'Zoologist,' 1889, p. 35.
[2] 'Birds of Lancashire,' p. 7.
[3] 'Yorkshire Naturalists' Transactions,' vol. ix. p. 79; 'Zoologist,' 1885, p. 387.
[4] 'Zoologist,' p. 2142.
[5] 'Zoologist,' 1849, p. 2482.
[6] Vol. ii. p. 48.
[7] Vol. iv. p. 270.
[8] 'Zoologist,' 1879, p. 267.
[9] 'Naturalist,' 1853, p. 182. Butler's 'British Birds' Eggs,' p. 28. 'Field,' April 28th, 1888.
[10] 'Zoologist,' p. 2698.
[11] 'Yarrell,' fourth edition, vol. i. 287.

no means the case, for besides the list of instances given by Mr. Harting,[1] and extended by Mr. Clarke,[2] two are said to have remained in Dorsetshire,[3] a few in the Isle of Wight,[4] three on the Scilly Islands,[5] one at Wimbledon,[6] and some at Herefordshire,[7] and one even as far north as Inverness-shire.[8] The food of the Ring Ouzel is pretty much what might be expected of a member of this genus. In Scotland they often betake themselves to the nearest shooting-lodge to feed on the cherries, where, as a boy, I have had much amusement in shooting at them. What they like best is the Mountain Ash (*Pyrus aucuparia*), but they will also eat blackberries,[9] berberis berries,[10] hawthorn and yew berries,[11] elderberries,[12] raspberries,[13] currants, gooseberries and plums,[14] strawberries, cherries,[15] sloe berries,[16] ivy berries,[17] juniper berries,[18] whortle berries and bilberries.[19]

White's Thrush, *Turdus varius*, Pall.

White's Thrush is an accidental visitant to this country from Asia, which has of late years been rather frequently observed, since so much attention has been paid to ornithology. Altogether it has occurred about eighteen times, and generally in the month of January. In some cases the birds have been seen about for several days; having evidently found a place where there was food, they kept to it until they met the usual fate of all rare birds, or were shot in mistake for a Woodcock, which from their habit of feeding on the ground, and in size and colour, they somewhat resemble.

The following is believed to be an accurate list of the existing records up to date :—

Hampshire, Jan., 1828	Yorkshire, no date
Ireland, Dec., 1842	Ireland, 1867
Warwickshire, Jan., 1859	Somersetshire, Jan., 1870

[1] 'Zoologist,' 1879, p. 203.
[2] 'Yorkshire Naturalists' Transactions,' vol. ix. p. 80.
[3] 'Birds of Dorsetshire,' p. 22.
[4] 'Venables' Guide,' p. 21.
[5] 'Birds of Cornwall,' p. 295.
[6] 'Field,' March 1st, 1884.
[7] 'Birds of Herefordshire,' p. 9.
[8] 'Field,' Dec. 31st, 1881.
[9] 'Naturalist,' 1856, p. 259; 'Field,' Oct. 26th, 1867.
[10] 'Field,' Oct. 19th, 1867.
[11] 'Zoologist,' 1872, p. 2492.
[12] 'Zoologist,' 1885, p. 336.
[13] 'Zoologist,' 1885, p. 386.
[14] 'Zoologist,' 1885, p. 437.
[15] 'Zoologist,' 1885, p. 387.
[16] 'Zoologist,' 1874, p. 3831.
[17] 'Birds of Middlesex,' p. 36.
[18] 'Birds of Ireland,' vol. i. p. 152.
[19] Gould, 'Birds of Great Britain.'

Kent, Jan. 5th, 1871 } Seen
Somersetshire, Jan. 6th, 1871 } only
Norfolk, Oct., 1871
Durham, Jan., 1872
Cornwall, Jan., 1874
Yorkshire, Nov., 1878
Berwickshire, Dec., 1878
Roxburghshire, Jan., 1879. Seen only
Devonshire, Jan., 1881
Yorkshire, Nov., 1881
Yorkshire, Jan., 1882
Ireland, Jan., 1885
Scilly Islands, Dec., 1886.

Siberian Thrush, *Turdus sibiricus*, Pall.

Mr. Frederick Bond possesses a Siberian Thrush which he obtained of Mr. Smither of Farnham in Surrey, near which place it is believed to have been killed by a Mr. Drewett, in February, 1885. Smither was a retired gamekeeper, and Gould[1] gives him a high character in his article on the Dartford Warbler. Mr. Howard Saunders has reason to believe that another was picked up at Bonchurch, in the Isle of Wight, in 1873 or 1874 by a gardener of the name of Saunders.

Black-throated Thrush, *Turdus atrigularis*, Tem.

A young male was shot by a man named Robinson, about a quarter of a mile from the town of Lewes in Sussex, on the 23rd of December, 1868, and was taken next day to Mr. T. J. Monk, at whose house the writer has more than once had the pleasure of examining it.

Rock Thrush, *Monticola saxatilis* (Linn.).

Has occurred once, viz., in Hertfordshire in May, 1843. Gould in his 'Birds of Great Britain' erroneously states that this unique specimen is in my father's collection. It passed into the possession of Mr. Thurnall, at whose sale it fetched seven pounds, and is now the property of Mr. F. d'Arcy Newcome.

Dusky Bulbul, *Pycnonotus obscurus* (Tem.).

About 1860 Mr. C. Matthews purchased this bird at a Hastings poulterer's.[2] As it was in the autumn, and as the Hastings poulterers whom I have had a good deal of experience of seldom have small birds which are not British, it is likely that this Ixos was obtained in the vicinity. I have heard its notes ring again in the Pine groves of Algeria, where it is not an uncommon bird, and whence perhaps our British example came.[3]

[1] 'Birds of Great Britain,' vol. ii.

[2] 'Zoologist,' 1866, p. 228.

[3] The Blue Thrush, the Dusky Thrush (*Turdus fuscatus*, Pall.), the Gold-vented Bulbul, and the American Robin, have put in a claim for admission into the British list, but they must be rejected.

IX.

WAYSIDE BOTANY AND NOTES IN NORWAY IN 1888.

By John Lowe, M.D.

Read 26th February, 1889.

It is generally admitted that the pleasure of travelling is greatly enhanced by having a varied source of interest along the route. After enjoying the splendid panoramas and glorious scenery, for instance, which one meets with in Norway, it is very restful to turn for awhile to the minor natural beauties which lie at our feet, and in noting the rarer and less familiar plants which are strewn beside our track, to discover fresh sources of interest, as it were, at every step.

There are few countries, and few modes of travelling, which lend themselves so well to this kind of observation as Norway and its carrioles.

Wayside Botany here affords, without deviating more than a few yards from the track, a host of species which it would require days of toilsome climbing to discover in this country.

I have thought, therefore, that a brief record of the products of such a journey might possibly be not uninteresting to some of the Members of the Norfolk and Norwich Naturalists' Society, for which, although no longer a Norfolk resident, I still entertain a warm regard; and your President has been good enough to say that such a paper would not be unacceptable.

The Norwegian Flora very closely resembles that of Great Britain, but with the addition of many Arctic and Scandinavian forms which do not occur in this country; although nearly all the Alpine species of Scotland are there to be met with. The list of species observed is fairly extensive, but by no means an exhaustive one, even of the districts through which my route lay. It might easily have been largely increased by short detours to the fjelds, but this was not practicable; and as the line laid out before starting was steadily adhered to, the whole of the species noted come strictly under the heading of this paper.

There is perhaps no feature of the Norwegian Flora which is more striking to a stranger, than the remarkable luxuriance of certain plants which with us are comparatively rare. For instance, *Cornus suecica*, which covers an immense area with its pretty white petaloid heads, succeeded in autumn by lovely clusters of scarlet berries.

In like manner along the fjords, especially on the Sogne, we find deep belts of *Polypodium phegopteris* and *P. dryopteris* extending for miles and attaining a large size. The glorious *Saxifraga cotyledon* also here attains its perfect development, clothing the rocks with its lovely plume-like tresses. Then we have great tracts of mountains covered with *Andromeda polifolia*, *Menziesia cærulea*, and *Rubus chamæmorus*, etc.

It would be interesting to ascertain the exact causes which give rise to the preponderance of these species in the struggle for existence, while many of our other British species are there unable to reach the same degree of growth which they attain with us. Our Ericas are not to be found in Norway, with the exception of *Calluna vulgaris*, which is fairly frequent, but never covers any great extent of ground.

When we have considered the differences of climate, the length of time during which the plants are covered with snow, the smaller amount of fertilizing insects in Norway, and all the other causes, such as drainage, soil, etc., which affect the growth of plants, there still remains a good deal unexplained. Here, no doubt, the "survival of the fittest" depends on two main conditions: (1) the fertilization and ripening of the seeds during the short summer, and (2) the protection of the roots during the prolonged winter.

But there is a third condition noticed by Gilbert White,* which has not been sufficiently regarded in the struggle, and that is, the combined effect of frost and sun. I believe there is no condition so destructive to vegetable life as a hot sun after a severe frost. I have found that scarcely any alpine plant is killed by tolerably severe frost, but as soon as a powerful sunlight is directed on the plant, the frozen leaves are killed by the rapid thawing. So it comes to pass that the plant, which, through the less succulent

* 'Natural History of Selborne.'

character of its leaves, its colour, or any other cause, is best able to withstand this rapid change of temperature, will be the one to survive. And it is very remarkable how widely plants differ in this respect. The influence of frost is also shown very strikingly in the manner in which it causes the surface ground to expand and lift the plant out of its bed, breaking across its rootlets, and leaving it to die. So the real damage to plant life in these regions is done not during the winter, but after the snow has melted, and after the winter protection has been removed, and hence we find the vegetation more profuse, as a rule, on the northern than on the southern sides of the mountains.

Leaving Hull at 2 a.m. on the 4th July in the "Eldorado," we had a perfectly calm passage to Stavanger, which we reached in twenty-seven hours. About midway in the voyage there came on a dense fog, during which the vessel proceeded at half-speed. At this time some birds, five in number, were observed flying into the dense smoke, in which they remained for about half a minute at a time. After doing this repeatedly over a lengthened period, they perched on the rigging near the deck, when they were seen to be Green Crossbills. The air at this time was extremely cold, and it was evident that they flew into the smoke for the sake of warmth. In about an hour the fog lifted, when the birds took wing and disappeared. Landing at Stavanger, I intended to have gone on to the Outer Hardanger by the Bukke Fjord; but, as we were two hours late in leaving Hull, the steamer had left on our arrival. Fortunately another route had just been opened to Odde, *viâ* Sand and the Suldal, and we found the little steamer bound for that place waiting at the pier.

On a previous visit to Stavanger in 1874, I was much interested in some experiments in fish-culture made by Mr. Hansen, upon whom I went to call a short distance from the town. He had two small lakes near his house, in which he had reared a large number of hybrid fish, a distinct cross betwixt the Common Trout and the Lake Char (*Salmo alpinus*). In the first of these lakes were quite young fish about four to five inches in length, which, on throwing in some pulverised cooked meat, came to the side in thousands. In the second lake the fish were from one to two pounds in weight. Mr. Hansen furnished me with a stick and a piece of string, at the end of which was a hook about an inch long, baited with a piece

of the cooked meat. In a few minutes I caught two fish of nearly two pounds weight and in good condition, which, after examination, were returned to the water. The sides were beautifully spotted as in the Trout, and the pectoral fins were white as in the Alpine Char. Some specimens of these were sent to the London Exhibition in 1862. Mr. Hansen (who died only last year) showed me an interesting collection of flint implements and gold ornaments which had been dredged up in Stavanger harbour. He had quite a little museum of local antiquities; and in his garden was a good collection of native plants, for, in addition to his other scientific attainments, he had a good knowledge of botany.

It was pleasing to find this Village Schoolmaster in the enjoyment of a pension from the Government as a recognition of his scientific work.

The little steamer "Rogeland" conveyed us to Sand in about six hours. At the small village of Jelse, in the Sandsfjord, there is a fine moraine with the best specimens of perched rocks I have seen. The moraine extends into the valley for about half a mile. The centre rises into a sharp ridge, along which many huge blocks are ranged. At the lower end, one of these, which could not have weighed less than two hundred tons, has fallen to the edge of the fjord. It is very unusual to see a moraine of this size near a fjord, as most of them come down at such a sharp angle that they disappear into the fjord.

Professor Forbes* says: "The absence of great travelled blocks, angular or otherwise, on the extensive uplands, is an important physical peculiarity."

It is certainly the fact that such blocks are absent on the uplands, though one would not expect it to be otherwise on a comparatively flat surface, where glacier streams do not exist. In the valleys such blocks are not uncommon.

From Sand the route lay through the beautiful Suldal. Many good species, chiefly British, were noted by the way, amongst which were, *Galium boreale*, *Habenaria bifolia*, *Cornus suecica*, *Pyrola secunda*, *Hieracium auricula*, *Arnica montana*, *Maianthemum bifolium*, and *Rubus chamæmorus*, the latter with ripe fruit; *Jasione montana*, *Ranunculus aconitifolius*, *Circæa alpina*, *Erigeron alpinus*, *Gymnadenia conopsea*, and the fine *Aconitum septentrionale*.

* 'Norway and its Glaciers,' p. 25.

Anthriscus sylvestris also occurs, but never in the profusion which one sees in this country. The Norwegian name "Hunde-kjeks" (*Anglicè* "Dog-biscuit") is still, in part, retained in Lincolnshire and the Eastern Counties to denote this plant, which goes under the name of 'Kecks,' the harder sound of the first *k* having replaced the softer one of the Norwegian.

Having crossed the Suldal Vand, from Osen, in a small steamer to Næs, a pleasant carriole drive through the charming Bratlandsdal took us by the side of the Lone Vand to Botten, whence a short row across the Röldal Vand, brought us to Röldal. In the course of this year a carriage road by the side of the lake will be finished, thus avoiding the necessity of rowing across, and of using the uncomfortable landing at the other end. At Röldal we struck the road from Christiana to Odde, and ascended over the "Horrabrækken Pass" (3400 ft.) into Gronsdal, noting a goodly number of Alpine species, such as *Salix lapponica*, *S. herbacea*, *Betula nana*, *Bartsia alpina*, *Silene rupestris*, *Arabis alpina*, *Silene acaulis*, *Alchemilla alpina*, *Cerastium alpinum*, *Gentiana lutea*, *Polygonum viviparum*, and a profusion of the lovely *Andromeda polifolia* and *Menziesia cærulea*. *Habenaria albida*, too, was abundant, and *Botrychium Lunaria*. Several other rare species of *Botrychium* are said to occur at Röldal, but I had not an opportunity of searching for them. Descending the Pass to Seljestad by the fine zigzag road, an excellent piece of engineering, *Saxifraga stellaris*, *S. aizoides*, and some large patches of *S. oppositifolia* were seen; also *Saussurea alpina*, *Gnaphalium norvegicum*, *Veronica saxatilis*, and *Sedum annuum*. The route from Stavanger to Odde is altogether one of the most charming in Norway, and will, ere long, be much frequented.

On the way from Odde to Vik it was soon evident that the reports I had heard of the excessive drought in the Hardanger district had not been exaggerated. The grass was everywhere burnt up and brown, and, of course, rare plants which were formerly abundant could only be found in cool and sheltered places. There had been no rain for many weeks, and very little since Christmas. The general opinion seemed to be that, owing to the scarcity of food, at least one-half the cattle and horses would have to be killed or sold.

In the evening, after landing at Vik, there appeared some of

those beautifully tinted clouds which were much discussed in 'Nature' a year or two ago. When first observed, they appeared over the high mountains west of Vik, behind which the sun was setting. One mass of cirrus, just above the highest peak, was of a brilliant green colour, the margins being bright red. Another cloud of fish-bone form was also brilliantly coloured, each segment being tinged with prismatic colours. On walking a short distance away from the mountain, so as to bring the sun into view again, the colour was found to have all disappeared; but as soon as it set behind the Folgefond, the clouds which were directly over the mountains in the sun's track; were again splendidly tinted. On my way to Hull I noticed a very similar appearance on light cirrus clouds, which were directly above the point where the sun was setting, behind a dark bank of cumulus.

The dark-red colour of the rocks which prevails throughout Norway is due to a confervoid growth which covers them. When a portion of the rock is uncovered, as we saw it on the Eidfjord Vand, by the side of which a new road is being blasted, the rock appears as pale grey granite. During a wet season, as when I last saw these rocks, in 1874, tiny streams trickled down the perpendicular face of the cliff, and in these a free growth of green moss sprang up in bands a foot or two wide, and separated by narrow spaces of dark rock. The appearance produced was not unlike a forest of trees, between which one could see, on looking fixedly, a far perspective in the depth of the rock; and it required no very vivid imagination to see strange and weird forms amongst the tree trunks. It is quite possible that some of the Norwegian stories of trolldi and gnomes may have had their origin in a scene like this. This year all the bands of moss had disappeared, owing to the drought.

Crossing the Eidfjord Vand, on the way to the Vöring Foss, some fine spikes of *Saxifraga cotyledon* were seen. A number of good species were noted on the journey, but the vegetation had suffered greatly by the drought, and there was not nearly the same profusion of flowers which I had seen formerly. Amongst those noticed were, *Saxifraga nivalis*, *S. stellaris*, *S. muscoides*, *S. oppositifolia*, *Pyrola uniflora*, *Rubus saxatilis*, *Ajuga pyramidalis*, *Alnus incana*, *D.C.*, *Epilobium angustifolium*, *Asplenium septentrionale*, *Struthiopteris germanica*, and *Woodsia ilvensis*. *Linnæa borealis* was

plentiful, but I was unable to find the double-flowered variety which I met with on my first visit.

On the way from Vik to Eidde some days were spent at Ulvik, which is, I think, one of the most charming places in Norway. The well-wooded mountains and distant snow peaks surrounding the fjord make such a picture as one rarely sees out of Switzerland. Add to this a cloudless sky (thermometer 82° F. in the shade), with cool delicious breezes from the fjord; an abundant supply of the purest water; a clean, well-furnished house and excellent cuisine, such as Madame Westrheim's, and we have as good a summer health resort as one can imagine. The sunsets here are of the loveliest. At nine p.m. (July 16) the snow mountains were coloured with a rich purple tint; as this faded, a bank of cloud above them assumed a bright red colour, and a rainbow appeared directly overhead. Strangely enough, this, too, was bright red, and so far as I could discover, no other colour was present in it. Along the shore *Plantago maritima* and *Glaux maritima* were fairly abundant. *Lychnis viscaria*, *Potentilla anserina*, a not common plant in Norway, *Rhamnus frangula*, and *Galeopsis versicolor* were also noticed; and on an excursion to the Espeland's Vand I found an abundance of *Lobelia dortmanna*, *Arctostaphylos alpinus*, *Carex atrata*, *C. œderi*, *C. pulicaris*, *C. glauca*, *Juncus filiformis*; *Lycopodium inundatum*, *L. annotinum*, etc., were also observed. I noticed on the way from Eidde to Vossevangen *Carduus heterophyllus*, *Eriophorum vaginatum*, *Artemisia vulgaris*, *Populus tremula*, *Prunus avium*, *Nymphæa alba*, *Montia fontana*; and at Vosstrendal, a dense mass of *Lysimachia thyrsiflora*, also *Comarum palustre*; at Vinge, *Linum catharticum*, *Carex vesicaria*, and *Galium palustre*; in the Stalheim Klev, *Impatiens noli-me-tangere*, *Lactuca muralis*, *Euonymus europæus* were rather plentiful, and *Poa cæsia*, *L.*, on rocks by the Fjord at Gudvangen; *Sesleria cærulea*, *Pimpinella saxifraga*, *Sedum album*, *S. villosum*, *Origanum vulgare*, *Cerastium alpinum*, *Calamintha clinopodium*, etc., were found near Gudvangen, and some remarkably fine fronds of *Woodsia*, which were fully nine inches long. On the shore at Lœrdalsören, a Cape plant (*Cotula coronopifolia*) was pointed out to me by Dr. C. Lindman. This is the only locality in Europe where it is found. It seems to be well established, and is evidently spreading, as I found it fully a mile from the spot where it was

first observed. At Aardal *Mertensia maritima* was abundant, also *Asperugo procumbens*, *Atriplex babingtonii*, *Lycopsis arvensis*, *Lepidium campestre*, *Erigeron acre*, and *Scutellaria galericulata*. During my stay at Aardal there occurred very frequent falls of rocks into the Fjord and the Aardal Vand. These took place generally during the day, and from surfaces of rock which had been heated by the sun, so that the masses were evidently split off by the expansion of the rock caused by heat. Small pieces, loosened perhaps by rain, were continually falling down 'couloirs,' but the larger pieces were split off from the under surface of an overhanging piece on the face of a perpendicular cliff. Some masses which had thus fallen near the Aardals Vand were of large size, one, weighing at least five or six tons, was seen by my 'roer-carl' when it fell about mid-day in June last year. It is possible that it might have been loosened by frost, but the immediate cause of its fall must have been due to heat.

On the journey to Vadheim, one of the most noticeable features was the immense profusion of *Polypodium phegopteris* and *P. dryopteris*, which clothed the sides of the fjord for miles. Between Vadheim and Ulvik were noted *Juncus alpinus*, *Woodsia hyperborea*, *Sibbaldia procumbens*, *Gnaphalium sapinum;* and between Reed and Ulvik, *Asplenium viride*, *A. septentrionale*, *Lysimachia vulgaris*, *Lychnis alpinus*, *Sparganium natans*, *Androsace septentrionalis*, *Saxifraga stellaris* and *S. nivalis*. Along the shore of the Jolster Vand *Ranunculus reptans* was seen in great beauty. Crossing to Faleide, I went thence to Löen, and across the Löen Vand to the fine Kjendals-brae. At Löen there is a fine runic cross fixed in the wall of the churchyard. Formerly it stood on the east end of the church, but was taken down and put in its present position when the church was rebuilt. In form it resembles the Iona crosses, and is evidently of great antiquity. It has been broken in two, but I discovered the lower half, which had been used as a coping stone, and found that the total height was ten feet. The stone, which is mica schist, is much weathered and full of coarse garnets.

Between Faleide and Hellesylt not many plants were met with; *Hypericum pulchrum*, *Pyrola rotundifolia*, *P. chlorantha*, *Rhynchospora alba*, being the chief. In the Geiranger *Saxifraga cotyledon* was seen in great profusion, but the flower spikes were,

owing to the dry weather here, as elsewhere, much smaller than usual. At the top of the Pass above Meraak, *Cornus suecica* in full fruit covered the ground with its scarlet berries. *Poa alpina vivipara* and *Eriophorum alpinum* were also seen. Between Söholt and Molde we passed a large patch of *Mulgedium alpinum* in full bloom. Its lovely masses of purple flower are nowhere seen in such perfection as in Norway.

One of the carriole horses which we had from Söholt was beautifully banded across the legs as so many of the Norwegian horses still are, though these Zebra forms are much less frequent than they were fourteen years ago. This one was almost as fully banded as the *E. chapmani*. *E. greryi* in Abyssinia, the most northern form which has been met with, has finer stripes, but is otherwise not to be distinguished from the Zebra. If the Norwegian horses be really descended from the Quagga, as seems more than probable, it would be interesting to know how they arrived at this region so remote from their natural home. The points of resemblance betwixt them and the Quagga are certainly very striking: their size, the small ears, tawny colour, dark stripe along the back, extending through the centre of the mane, the outer part of which is tawny, and lastly, the dark bands across the legs. Types of this kind, which were formerly very common, are seldom seen now, the prevailing colour being chestnut or black.

In the Romsdal the more noticeable plants were, *Diapense lapponica*, gathered by a fellow traveller. On the Romsdalhorn, *Potentilla aurea*, and at Stueflöten, *Polygonatum verticillatum*, *Dianthus deltoides*, *Subularia aquatica*, which occurs in great abundance by the Rauma Elv, *Astragalus alpinus*, *Androsace septentrionalis*, *Primula scotica* and *Plantago major*.

Before reaching Dombaas, I had noticed that all the Potato tops, as far down the valley as Lesjvœrk, had suffered severely from the previous night's frost (Aug. 16th), being turned completely black. The thermometer had fallen to 2° Cels. On the evening of the 17th it again became very cold, and the thermometer at 8 p.m. was 4° Cels. Fearing a repetition of the severe frost, which would have quite ruined the crops both of corn and potatoes, Mr. Sivert Dombaas arranged with all the neighbouring 'bonders,' to put in operation a plan, which, in former times was constantly practised under like circumstances. All the men in the district turned out

with axes into the woods, and cut down branches, of which they made huge fires at stated intervals, putting on during the night a continual supply of green fuel, so as to create as much smoke as possible, the object being to fill the valley full of smoke, and thus to check radiation. Mr. Dombaas believes that they could always in this way make a difference of several degrees, and thus save their crops. On the present occasion the night came over thick and cloudy, and the freezing point was not reached, 1° Cels. only being registered. On the mountain opposite Dombaas were a number of good plants, such as *Gentiana nivalis* and *G. tenella*, in great profusion; *Corallorhiza innata* also abundant; *Habenaria viridis*, *Gymnadenia conopsea*, *Pyrola rotundifolia*, *P. uniflora*, *Saxifraga tridactylites*, *Lycopodium alpinum*, etc. At Jerkind, *Carex incurva* was found covering the roadside for some miles, as afterwards at Dalen. In Britain there is, I believe, only one locality for this plant, viz., on the shore of the Frith of Forth at Long Niddry, where I found it growing very many years ago. The late Professor Balfour told me that he had been unable to find it in this locality. There was a considerable patch of it in 1857, but it may have since disappeared, as it grew near to the shore of the Frith of Forth. I also noticed *Luzula arcuata*, *Lychnis viscaria*, *L. alpina*, *Pedicularis oederi*, *Astragalus oroboides*, *A. alpina*, *Vahlbergella apetala*, *Ranunculus glacialis*, *Cardamine amara*, *Veronica alpina*, *Pinguicula vulgaris*, *Phleum alpinum*, *Primula scotica*, *Anemone vernalis*, etc. *Saxifraga cernua*, which I found on the Dovrefjeld on my former visit, attains a much finer form than it does in Scotland, where it seldom flowers, being propagated only by bulbils, while here it produces fine flowers freely, and probably ripens its seeds.

On digging up some roots of *Primula scotica*, I found that they emitted a delicious odour of Violets, three or four roots giving off as much perfume as a large bundle of those flowers. The roots of *Primula stricta*, which I found subsequently, were equally scented, and *P. farinosa* has the same peculiarity. In a large number of other species which I have since examined this odour could not be detected. Lindley mentions the roots of *P. veris* as smelling of aniseed, and says that it was formerly employed as a nervine tonic, and also as a diuretic.* I should rather describe this as the odour of "laudanum," which is common to many other species. The scent

* 'Vegetable Kingdom,' p. 645.

in all these cases is found more or less throughout the year, as in the root of the *Florentine iris;* but I think it is strongest in the autumn, and especially after frost, which developes strong perfumes in the leaves of several of our forest trees, such as the Plane-tree, which gives out a powerful scent, and the Ash, in which I have several times observed a very strong odour like that of Stephanotis. In these the scent is only developed after frost.

On the mountains above Jerkind, Juniper and Dwarf Birch (*Betula nana*) abound. Many plants of the latter are apparently of great age, spreading along the ground for four or five feet. These serve as a great protection to various species of Cladonia, which exist here in singularly beautiful forms. Where the Birch and Juniper are absent, large patches of mountain are stripped of Reindeer Moss by the wind.

The highly-elevated snow-line, and the absence of glaciers on the Dovrefjeld, have been the frequent subject of comment by writers on Norway. Thus, Lieut. Biddulph* says: "It is worthy of remark that the Folgefond, though of less elevation than the Hardanger, from which it is only separated by the Fjord, holds more ice and snow; the latter exhibiting no glaciers, even round the towering peak of the Harteigen. But it is still more remarkable that the Dovrefjeld, one hundred and fifty miles farther north, which rears its highest point, Sneehatten, to the height of 7513 feet (upwards of 2000 feet higher than the highest part of the Folgefond), and is further inland, and consequently more removed from the mollifying influences of the Atlantic breezes, has not a single glacier and no extended back of snow." Professor Edward Forbes† noticed that the snow level on the mountains near Vossevangen was extraordinarily low compared with that of the Fillefjeld and Dovrefjeld." The reason of this is not far to seek, and may be found, I think, in the fact that the large amount of vapour brought along the coast by the Gulf Stream is precipitated by the cold of the Folgefond and the mountains near the coast, falling as rain in the Bergen district, and as snow on the Folgefond and mountains. The rain-clouds are thus almost deprived of moisture, the rainfall at Bergen being annually 72·25 inches, and at Floro 75·27; while on the Dovrefjeld it is only 14·39 inches, and thus the snowfall in this

* Forester's 'Norway in 1848-49.'

† Loudon, 'Magazine of Natural History.'

locality is not more than can be melted during the succeeding summer. It is in accordance with this explanation that the snow-line is 1000 feet lower on the sea face of the Folgefond than it is on the land side or on the Hardanger Fjeld. At Bergen, Professor Haustein says the thermometer seldom falls below zero, so that snow and ice are not very common. Professor James Forbes* remarks, that the rise of the snow-line "depends partly on the same cause as the rise of the snow-line in Asia; but in great measure also on the greater effect, towards the interior, of the solar rays, which, at Bergen and on the coast generally, are obscured by clouds and fogs." It is obvious that both these conditions depend on the discharge of moisture from the rain-clouds near the coast.

From Jerkin the route lay through the Foldal to Lille Elvedal. At Dalen *Primula stricta* was seen in great abundance in all the meadows. *Calamagrostis lapponica* was also noted. The descent into the valley above Dalen, is through loose sand, down an incline of about 200 feet. Terraces of sand and loose gravel occur frequently at high elevations, often 600 to 700 feet. Towards the lower end of the valley these become more numerous, sometimes in a series one above the other. The lowest one, through which the Folda river has cut its way, forms a perpendicular cliff of about 100 feet, the upper half of which is pure sand in thin strata, the lower part being composed of clay and boulders. Here and there, in the centre of the valley, may be seen good sized moraines with huge 'perched' rocks. The general appearance of the terraces suggests the idea that the sand must have been deposited by marine action, and that the beds of immense thickness were subsequently cut through by glaciers, and the valley deepened by erosion. It is impossible, I think, to believe that sand of such depth, and so distinctly stratified, can have had any other origin than this; and it points strongly to the deposit having taken place in the pre-glacial period, as the submergence must have extended nearly to the level of the Dovrefjeld. Anyhow, there is here one of the most remarkable formations to be seen in Norway, and one well worthy the attention of geologists.

In concluding these fragmentary Wayside Notes I would add the following notice, copied in 1874, as an amusing illustration of a Norwegian idea of English 'Sport.'

* 'Norway and its Glaciers,' p. 215.

"REINDEER SHOOTING (*Rensdyrjagt*).

"The signer gives by this, allowance to shoot *seven tame Reindeer* that go on the mountains between Koihne and Hedalen near the Öien station at Gudbrandsdalen, three-quarters of a Norwegian mile from the farm Harildstad. They weigh most likely about one hundred stone English, and it costs 65 spec. dol. to shoot one of them or the whole lot. If I get 90 spec. dol. for them, he may keep the skin and the horns too; and if I get 125 spec. dol. for them, he may keep them alltogether. The money is to be paid down to Storthingsmand Harildstad at Koihne (N. Troen), and he will also give instructions both about the place where they go, and about whom there are to go with the shooter to skin them and bring it down. They are very easy to find, and the tour from Öien might be done all together in a day. The don't move from the district, the have chosen for themselves till the end of September, and it is only about a quarter of a mile long, and not quite so baad.

"Öien Gudbrandsdalen,

"13 July, 187

"O. A. T. TRETHEIM

"(One of the Owners)."

The following is a list of the plants which were noted :—

THALICTRUM ALPINUM, L.	
„ MAJUS, Murr.	Vöring Foss.
„ SIMPLEX. L.	Dovre.
RANUNCULUS REPTANS, L.	Jolster Vand.
„ ACONITIFOLIUS, L.	Simodal.
„ GLACIALIS, L.	Dovrefjeld.
CALTHA PALUSTRIS, L.	Sand.
ACONITUM SEPTENTRIONALE, Koll.	Common.
ANEMONE VERNALIS, L.	Jerkin Dovrefjeld.
„ NEMOROSA, L.	Sand.
PAPAVER NUDICAULE, L.	Drivstuen Dovrefjeld.
NYMPHÆA ALBA, L.	
ARABIS PETRÆA, Lam.	Near Ulvik.
„ HIRSUTA, Br.	
„ ALPINA, L.	Vöring Foss.

Draba hirta, L.	
Cardamine amara, L.	Jerkin.
Cochlearia officinalis, L.	Ulvik.
Lepidium ruderale, L.	Christiania.
,, campestre, Br.	
Sisymbrium sophia, L.	Molde.
Thlaspi arvense, L.	Romsdal.
Subularia aquatica, L.	Rauma Elv.
Viola sylvatica, Fr.	
,, tricolor, L.	Mölmen.
,, palustris, L.	
,, lancifolia, Thore.	
Drosera longifolia, L.	Sand.
,, rotundifolia, L.	Sand.
Silene acaulis, L.	
,, rupestris, L.	Frequent.
,, maritima, With.	
Lychnis diurna, Sibth.	
,, flos-cuculi, L.	
,, viscaria, L.	Simodal.
,, alpina, L.	Near Ulvik.
Wahlbergella (Lychnis) apetala, Fr.	Jerkin, Dovrefjeld.
Cerastium alpinum, L.	
Stellaria graminea, L.	Stalheim Kl.
Sagina saxatilis, Wimm.	
Dianthus deltoides, L.	Stueflöten, Romsdal.
Malachium aquaticum, Fr.	Stalheim, Kl.
Diapense lapponica, L.	Romsdalhorn.
Montia fontana, L.	
Hypericum pulchrum, L.	Grodaas.
,, perforatum, L.	,,
Linum catharticum, L.	Stalheim.
Tilia parvifolia, Ehrh.	Bet. Eidde and Voss.
Rhamnus frangula, L.	Ulvik.
Euonymus europæus, L.	Stalheim Kl.
Geranium sylvaticum, L.	Sand.
,, pratense, L.	
Erodium cicutarium, L'Hérit.	

Impatiens noli-me-tangere, L.	Stalheim Klev. Oscar's Hall, Christiania.
Astragalus oroboides, L.	Dovre.
,, alpinus, L.	Lesjvœrk.
Anthyllis vulneraria, L.	Drivstuen.
Potentilla anserina, L.	Ulvik.
,, argentea, L.	Vöring, Do.
,, aurea, L.	Stueflöten.
Rubus saxatilis, L.	Voring Foss.
,, idæus, L.	,,
,, chamæmorus, L.	
Fragaria collina, Ehrh.	
Alchemilla alpina, L.	
Sibbaldia procumbens, L.	
Prunus avium, L.	Bet. Eidde and Voss.
Rosa villosa, L.	Espelands V. Ulvik.
,, alpina, L.	Tofte Moen.
Comarum palustre, L.	Vosstrendal.
Geum rivale, L.	Vöring Foss.
,, urbanum, L.	
Saxifraga oppositifolia, L.	
,, nivalis, L.	
,, stellaris, L.	
,, aizoides, L.	
,, var. aurantiaca.	Dovre.
,, tridactylites, L.	
,, cernua, L.	Drivstuen.
,, muscoides, Wulf.	Vöring Foss.
,, cotyledon, L.	
Parnassia palustris, L.	
Sedum anglicum, L.	Sand.
,, album, L.	
,, acre, L.	
,, annuum, L.	Sand.
,, rhodiola, D.C.	
,, villosum, L.	Gudvangen.
Tamarix anglica, L.	
Epilobium angustifolium, L.	Ulvik.
,, alsinefolium, Vill.	

Epilobium alpinum, L.	
Circæa alpina, L.	Vöring Foss.
Carum carui, L.	
Anthriscus sylvestris, L.	
Angelica sylvestris, L.	
Archangelica officinalis, Hoffm.	
Pimpinella saxifraga, L.	Gudvangen.
Cornus suecica, L.	
Adoxa moschatellina, L.	
Viburnum opulus. L.	
Linnæa borealis, Gronov.	Flore pleno. Vöring Foss.
Galium boreale, L.	Vöring Foss.
,, verum, L.	Ulvik.
,, saxatile, L.	
,, palustre, With.	Vinge.
Valeriana officinalis, L.	
Valerianella olitoria, Mch.	
Scabiosa incisa, L.	
Jasione montana, L.	Sand.
Solidago virgaurea, L.	
Artemisia vulgaris, L.	Between Eidde and Voss.
Erigeron acre, L.	Aardal, Sogne.
,, alpinum, L.	Dovrefjeld.
,, uniflorum, L.	,,
Gnaphalium supinum, L.	Near Udvik.
,, sylvaticum, L.	
,, norvegicum, Gunn.	
Cotula coronopifolia.	Lærdalsören
Matricaria chamomilla, L.	Vosstrendal.
Mulgedium alpinum, Less.	Near Visnœs.
Arnica montana, L.	Sand.
Tanacetum vulgare, L.	
Arctium lappa, L.	
Cnicus heterophyllus, Willd.	Between Eidde and Voss.
,, arvensis, Hoffm.	
Saussurea alpina, D.C.	
Centaurea scabiosa, L.	
Crepis paludosa, Mœnch.	
Hieracium auricula, L.	Sand.

Hieracium boreale, Fr.	
Lactuca muralis, Fresen.	Stalheim Kl.
Lobelia dortmanna, L.	Espelands Vand.
Campanula rotundifolia, L.	
Vaccinium vitis-idæa, L.	
,, uliginosum, L.	
,, myrtillus, L.	
,, oxycoccus, L.	
Arctostaphylos alpina, Spreng	
,, uva ursi, Spreng.	
Azalea procumbens, L.	
Calluna vulgaris, Salisb.	Sand.
Andromeda polifolia, L.	,, Dovre.
,, hypnoides, L.	Ulvik ,,
Pyrola minor, S.W.	
,, rotundifolia, L.	Faleide and Dombaas.
,, secunda, L.	
,, chlorantha, Sw.	Kjos.
,, grandiflora, L.	Dombaas.
Lysimachia vulgaris, L.	Reed.
,, thyrsiflora, L.	Vosstrendal.
Androsace septentrionalis, L.	
Glaux maritima, L.	
Trientalis europæa, L.	
Primula stricta, Hornem.	Dalen.
,, scotica, Hook.	Dovre.
Menyanthes trifoliata, L.	Sand.
Gentiana campestris, L.	
,, amarella, L.	
,, purpurea, L.	Dovrefjeld.
,, tenella, Rottb.	
,, nivalis, L.	Dombaas.
Polemonium cæruleum, L.	,,
Myosotis sylvatica, Hoffm.	
Asperugo procumbens, L.	Aardal Sogne fd.
Anchusa officinalis, L.	Drivstuen.
Mertensia maritima, L.	Stavanger, Aardal.
Lycopsis arvensis, L.	Aardal.
Plantago major, L.	Holaker.

Plantago maritima, L.	Ulvik.
Linaria vulgaris, Mill.	Stalheim Kl.
Verbascum nigrum, L.	Simodal.
„ thapsus, L.	
Digitalis purpurea, L.	
Veronica alpina, L.	
„ saxatilis, L.	
Bartsia alpina, L.	Dovre.
Euphrasia officinalis, L.	Jerkin.
„ „ var. gracilis.	
Melampyrum sylvaticum, L.	Sand.
Pedicularis palustris, L.	
„ sylvatica, L.	
„ œderi, Vahl.	Dovre.
Pinguicula vulgaris, L.	
Rhinanthus crista galli, var.	„
Mentha arvensis, L.	
Origanum vulgare, L.	Gudvangen.
Calamintha clinopodium, Barth.	„
Ajuga pyramidalis, L.	Sand and Dovre.
Scutellaria galericulata, L.	Aardal, Sogne.
Galeopsis tetrahit, L.	
„ versicolor, Curt.	
Polygonum aviculare, L.	
„ persicaria, L.	
„ hydropiper, L.	
„ viviparum, L.	
Oxyria digyna, Hill.	
Empetrum nigrum, L.	
Atriplex babingtonii, Woods.	Lœrdalsören.
Myrica gale, L.	Sand.
Urtica urens, L.	
Betula nana, L.	Near Ulvik, Dovre.
Alnus incana, D.C.	Simodal.
Salix aurita, L.	
„ lapponum, L.	Nedre Vasenden.
„ caprea, L.	
„ lanata, L.	
„ argentea, Sm.	Vinge.

Salix glauca, L.	
,, herbacea, L.	
Populus tremula, L.	Skjerven.
Orchis maculata, Gunn.	Sand.
Gymnadenia albida, Rich.	Sand. Dombaas.
Habenaria viridis, L.	Dombaas.
Gymnadenia conopsea, R.Br.	Sand. Dombaas.
Corallorhiza innata, R.Br.	Dombaas.
Polygonatum verticillatum, All.	Romsdal.
Maianthemum convallaria, Roth.	
Convallaria majalis, L.	
Narthecium ossifragum, L.	Simodal.
Tofieldia palustris, Hud.	Frequent.
Juncus trifidus, L.	Dovrefjeld.
,, balticus, Willd.	,,
,, filiformis, L.	Espelands V. Ulvik.
,, alpinus, Vill.	Ulvik.
,, castaneus, Sm.	
,, balticus, Willd.	
,, triglumis, L.	
Luzula arcuata, Hook.	Dombaas. Jerkin.
,, spicata, D.C.	
Potamogeton natans, L.	
Triglochin palustre, L.	
,, maritimum, L.	
Sparganium natans, L.	Nedre Vasenden.
Rhynchospora alba, Vahl.	Near Falejd.
Eriophorum vaginatum, L.	
,, alpinum, L.	
,, scheuchzeri, Hoppe	
Carex incurva, Lightf.	Jerkin. Dalen.
,, pulicaris, L.	Espelands V. Ulvik.
,, glauca, Murr.	,,
,, œderi, Ehrh.	,,
,, atrata, L.	,,
,, vesicaria, L.	
,, pulla, Good.	
,, vulgaris, Fr.	
,, capillaris, L.	

Phleum alpinum, L.	Jerkin.
Calamagrostis epigejos, Roth.	
„ lapponica, Hartm.	Dalen. Dovrefjeld.
Poa alpina, L.	
„ cæsia, Sm.	Gudvangen.
Festuca vivipara, Koch.	
Sesleria cærulea, Scop.	Stalheim Klev.
Juniperus communis, L.	
Cryptogramma crispa, R. Br.	
Asplenium viride, Huds.	Between Reed and Ulvik.
„ adiantum nigrum, L.	
„ trichomanes, L.	
„ septentrionale, Hull	Near Ulvik.
Woodsia ilvensis, R. Br.	Gudvangen.
„ hyperborea, R. Br.	
Polystichum lonchitis, Roth.	
„ angulare, Presl.	
Polypodium phegopteris, L.	
„ dryopteris, L.	
„ vulgare, L.	
„ oreopteris, L.	
Cystopteris fragilis, Bernh.	Vöring Foss.
Struthiopteris germanica, Willd.	
Botrychium lunaria, Sw.	
Equisetum pratense, Ehrh.	
„ limosum, Sm.	
„ sylvaticum, L.	
Lycopodium selago, L.	Sand.
„ clavatum, L.	
„ annotinum, L.	Ulvik.
„ inundatum, L.	Espelands Vand, Ulvik.
„ alpinum, L.	Dombaas.

X.

HAWKS: HOW OBTAINED AND TRAINED.

By T. J. Mann.

Read 26th February, 1889.

In attempting to fulfil my promise to our Society, I think it is only fair on my part to say that I am quite unaccustomed to speaking or reading in public, and must therefore rely on your kindness to warn me whether I am reading too rapidly or indistinctly.

As the technical terms in Falconry cannot well be avoided in this paper, I have had a small 'Glossary' printed and distributed, which will, I hope, enable my hearers to follow their meaning.

My paper is divided into three parts, viz.:

(1) The method of Capturing Passage Hawks in Holland.
(2) Eyesses.
(3) The Training of Hawks generally.

To commence with the capture of the Passage Hawk. The migration of birds is a matter of deep interest to naturalists, and the month of October is looked forward to by the Dutch Falconers with an extra keen interest, as it is in the latter part of this month that the Raptores pass southward, and the chances of taking the Passage Hawks occur. If the weather be very bright and clear, with but a slight wind, the Raptores pass southward at a great height, and, as I am informed, considerably fewer are then taken than is the case should the weather be less clear or more windy, which atmospherical condition causes the coveted Peregrine to fly nearer the earth, when it is more liable to be attracted to the decoy Pigeons. Unfortunately I have never been to Holland, and therefore I am indebted to my friend, Mr. J. E. Harting, for much information concerning the method used by the Dutch Falconers at Valkenswaard in taking the Passage Hawks, as also to John Frost,

Falconer to the Old Hawking Club, whose head-quarters are in the New Forest. The Hawk most prized is the female Peregrine (the Falcon), but the male (the Tiercel), the Goshawks and Merlins are also taken at the huts. The Falcons are mostly used for Rook Hawking in the following spring, and are also flown at Grouse in August. As a rule, excellence in particular branches of sport is handed down from man to man, or from father to son, and this is especially noticeable in Falconry, for the Falconers who work the huts at Valkenswaard, are, I believe, the Mollen family, sons of Adrien Mollen, who was assistant to the celebrated "*Jean Bats*" from 1833–36, when there were as many as eighteen Falconers resident at Valkenswaard, and thirty huts erected in the migration period. The celebrated *Low Club* was established in 1811, and in 1842 this Mollen became its head Falconer. Mr. Edward Clough Newcome, a well-known Norfolk man, was a member of this club. In Livermere Magna churchyard in Suffolk, there is a tombstone with an inscription of which the following copy has been kindly sent me by Michael Frost, the father of my present Falconer, Alfred Frost:

"Here lieth ye body of
William Sakings,
he died ye 16th March, 1689,
he was Forkner to King Charles
ye 1st, King Charles ye 2nd, King
James ye 2nd,
Aged 78 years."

I will now proceed to describe the method by which the Hawks are taken; and to enable you the more readily to realize the description, I have had a model constructed, as far as possible, on a small scale, which you see here, from the description in 'Essays on Sport and Natural History' by J. E. Harting, and from personal notes sent me by John Frost.

The great plain of Valkenswaard is situate in the southern part of the district of North Brabant in Holland, and has an approximate area of twelve miles by three. The huts in which the Falconers conceal themselves to await the passage of the migrants are mound-like in formation, being about five feet in diameter at the base, and four feet high, gradually narrowing from the base upwards. The walls are constructed with sods of heather dug from the plain. A disused cartwheel supported on stakes built into the wall forms the frame-

work of the roof, on this are placed more heather sods having the heather side undermost, any old litter having been laid on over this to give the necessary rounding to the roof, another layer of sods, very neatly fitted to keep out the rain, is placed over all, *heather side up*. To give more head-room, or as Paddy says, "to heighten the roof," the floor is dug out: the hut will then just accommodate two men when sitting side by side on chairs, from which the backs have been removed (this being necessary to secure freedom of movement). Facing the east, and immediately under the wheel, an opening or window is cut through the wall, measuring two feet by one foot; at the side, *i.e.*, north or south, a doorway is made large enough to allow of a full-sized man creeping through. No *fixed* door is used, but a kind of hurdle, built up of heather and split rods, is made to effectually close and conceal the opening; by this method, you will see that the hut is sufficiently disguised after nature to deceive even "*a Hawk's eye.*" The actual working appliances, if so I may designate them, are simple, but constructed and arranged with elaborate care, for there must be no point which differs in its detail from a perfectly *natural* appearance. About fifty yards from the hut, to the right and left of the window, are placed two fir poles from sixteen to twenty feet high, and about forty-five yards distant from each other (in the model, owing to want of space, these poles, the pigeon huts, and the bow-net are placed much nearer to the hut; if therefore you will kindly imagine them to be removed about as far again from the hut as they now appear, you will realize their proper position; in other respects I believe the model to be fairly accurate). To the top of each of these poles a strong but light line is attached, which leads to the hut, passing through the window to the Falconer's hand. These lines when not pulled tight will, as you can understand, pass down the poles and then along the ground to the hut. Ten or twelve yards down the line from the top of the left-hand pole, a trained Hawk is attached by the end of his leash, and yet a few yards further towards the hut a bunch of feathers is made fast. Now notice what takes place when the Falconer pulls this line: the Hawk and bunch of feathers are both suddenly raised many feet from the ground, and the line being pulled and held tight, the Hawk naturally flies round and round the line at the radius of his leash, and to any passing bird presents the appearance of being engaged in flying some live quarry, *i.e.*, the bunch of

(*a*) 20-ft. Pole, to which decoy Pigeon is attached.
(*b*) Shelter hut for decoy Pigeon.
(*c*) 20-ft. pole to which decoy Peregrine is attached.
(*d*) Decoy Peregrine.
(*e*) Bunch of Feathers.
(*f*) Shelter hut for Bow-net Pigeon.

(*g*) Bow-net.
(*h*) Eyed pin, through which line passes to check Pigeon and Hawk in centre of bow-net.
(*i*) Sentinel Shrikes.
(*k*) Falconer's hut.

feathers. On the Falconer loosing the string, of course both Hawk and feathers return to the ground. From the right-hand pole a similar line runs through the hut window, only instead of a Hawk and bunch of feathers, to this one a live white pigeon is attached by braces; at the foot of the pole the Falconer has placed a small shelter or hut of heather sods, just large enough to permit the pigeon, when running on the ground, the line being slacked, to hide itself away in should danger threaten. A few yards from the window, placed right and left respectively, are two little heather mounds, so formed, that on the summit of each, a little cave, hollow, or retreat is fashioned, and around and over which a few bent twigs in the shape of arches are fixed. These small hillocks with their caves perform an important part in the Hawk-snarer's programme, for they are the earthworks of the signalling corps. Poor indeed would be the luck of the patient Falconer had he not extra eyes to assist him, and these he finds placed at his service by the Great Grey Shrike. This bird, which is perhaps more widely known as the Butcher-bird, is possessed of a most remarkably keen sight, and one being fastened by a line to each of these mounds, gives the Falconer notice by his flutterings and cries of the approach of a Hawk, although it will probably be a considerable time before the Falconer can localize the minute speck in the remote distance.

To the right and left of the hut, and on some occasions to the rear, at a distance of about fifty yards, are placed other little huts also built of heather sods, about two feet in length and one foot in height and width: these are meant to contain one live pigeon in each, attached by braces to lines which run to the Falconer's hut, and passing through the wall, are within easy reach of the Falconer's hand. The ends of these pigeon hutches, remote from the hut, are made of laths of wood fixed as bars, so that food and water being placed outside, the prisoner can feed without wasting his food. The other ends are closed by little lean-to doors similar to that of the main hut, and not being fixed, the Falconer can, when necessary, pull the pigeon backwards out of his hutch, by means of the line. A few yards nearer towards the hut than these hutches are fixed bow-nets concealed with heather, the sides remote from the hut being firmly pegged down, the other connected by wire pulls with the hut. In the centre of each net between the bows an iron pin with a ring head is driven into the ground. The line from the

pigeon in the hutch passes through this, for what purpose you will soon understand.

May I hope that I have so far made the model fairly explicit. If I have been unsuccessful, I shall be only too happy to do my best to give every information on the conclusion of my paper.

Everything is now ready for the attempted capture. Let us suppose ourselves to be inside the hut, with the Falconer seated at our side, the door closed. Outside, the Butcher-birds are merrily hopping about their fortresses, the white lure Pigeon to the left is busily preening his feathers, whilst to the right the Hawk sits.

Suddenly a change comes over the actions of the Shrikes, they flutter, scream, and in a few moments seek shelter in their little entrenchments. This is the signal to us that a Hawk is nearing, and although we can *hardly* discern any semblance of a bird in the sky, still that small speck, gradually increasing as it closes in, is a Hawk. The Falconer now pulls tight the line running to the left-hand pole, up goes the Hawk and bunch of feathers, the former flying wildly round in circles at the limit of his leash. By this time the Passage Hawk has neared sufficiently to perceive, as he imagines, a brother Hawk flying a quarry, so he elects to join in the chase. Suddenly he loses sight of it, but espies a fine white Pigeon flying in almost the same direction, for the Falconer has dropped the left-hand line and pulled the right one, allowing the Hawk and feathers to descend, and raising the white lure Pigeon from the ground. Not suspecting foul play, the Passage Hawk commences to fly the white Pigeon. But with great judgment the Falconer, who can now see his would-be captive, slackens the Pigeon's line, and immediately the lure hastens to save its life by seeking shelter in its hutch, at the base of the right-hand pole. At this same instant the Falconer seizes and pulls the line running to the right-hand hutch, with the result that the Pigeon in it is dragged against the heather door, which, falling away, releases the prisoner, who, flying upwards, is immediately stooped at and cut down by the Passage Hawk, which in these few seconds has arrived overhead. Hawk and Pigeon come to earth bound together, perhaps fifteen yards from the bow-net, and whilst the pigeon is struggling vainly in the vice-like grip of the Hawk, the Falconer is very gently but firmly drawing in the cord to which the Pigeon is attached. Slowly and surely, little by little, Hawk and Quarry are drawn towards

the iron ring previously referred to, on and on, struggling and fluttering, until at last, check ! The Falconer knows by the sudden dead resistance (for he cannot see) that his prey has been dragged to the centre of the bow-net circle, *i.e.* the iron ring. Taking a firm grip of the bow-net wire, the Falconer gives a long pull and a strong pull, and if commonly fortunate, his patience and skill are rewarded by the capture of a fine Passage Hawk. Having taken the Hawk, the Falconer proceeds to withdraw it from the bow-net by the legs, great care being requisite to avoid damaging any of the feathers. Once clear of the net, *a Sock*, that is, the ankle portion of a stocking, is slipped over the Hawk downwards from the head, and a rufter-hood having been put on, the captive is removed to the hut, where he lies helpless as in a straight waistcoat.

Eyesses.

In this age of the Pheasant rearing and battue craze, and of specimen-collecting for the birdstuffer to distort, it is a matter of surprise to me that any Peregrines are allowed to exist, let alone to breed on our cliffs. Still many landowners, I am delighted to say, do all in their power to prevent any disturbance to the Eyrie, but when this happens to be placed on a sea cliff the shore-shooters are beyond all control. I have known an incident which is wonderful to me, when I consider how few Peregrines we have, of a pair of Peregrines ; the Tiercel was shot, but in fourteen days the Falcon appeared with another mate, nested, and finally reared her young. The general method by which, with considerable danger, Eyesses are obtained, is by men or boys, who with the aid of ropes and check cords are cool enough to go over the cliffs in the hope of reaching the Eyrie. From what I have seen, the greatest danger is to be feared from falling stones and rocks, and the fretting through of the retaining rope. Many cliff climbers thus risk their lives to reach the Eyrie, not I fear in most instances to obtain the Eyesses, *but the eggs*, by which act of vandalism all chance of securing the Eyesses is lost to the Falconer, who has therefore to fall back on Passage Hawks. It is an acknowledged fact, that a pair of birds whose nest has once been robbed will invariably select the next season a position far more difficult of access, if possible beneath some overhanging crag, so that for the cliff climbers to swing in under even with the assistance of their

ropes is almost impossible, and frequently the birds quit the neighbourhood altogether. It is not however the Falconidæ only which suffer, I regret to say, from this pernicious habit of egg-taking. The Chough, the Buzzard, the Raven, and other of our rarest birds are doomed to become extinct at no very distant period, unless all true sportsmen, naturalists and lovers of nature generally, make an urgent and speedy protest against this unsportsmanlike mania. Few districts are left now in Great Britain where the Peregrine nests. Along our south coast, in Wales, and the west coast of Scotland, a few birds still build, also on the north and west coasts of Ireland, and last year a pair reared their nestlings on a northern moor in sight of Scaw Fell.

It may be perhaps of some little interest to notice here some particulars of the taking of Peregrines on Hunstanton Cliff in the seventeenth century, kindly given me by Mr. Hamon le Strange of Hunstanton Hall. The number of Peregrines captured from 1604 to 1653 by his ancestor Sir Hamon le Strange was eighty-seven. This copy of the original most interesting table I shall be happy to show to any one anxious to see it on my paper being finished.

And now we find ourselves with two sets of raw material, *i.e.*, the Passage Hawks and the Eyesses, and I will endeavour to give you, in as few words as possible, the method by which this raw material is converted into such a priceless fabric as a well-trained Falcon or Tiercel. But before proceeding to do so, allow me to give you a short extract from 'The Gentleman's Recreation,' a work in four parts by Nicholas Cox, published in 1697. On pages 31 and 32 of his Part 2, entitled 'a Treatise on Hawking and Falconry, &c.,' he says: "General Instructions for an *Ostrager* or Falconer.'

"Let his Jesses and Bewets be of good leather, having bells big and shrill according to the proportion of the Hawk, with a hood that is bossed at the eyes and sizable for the head. He must use his Hawk in such manner that he may make her grow familiar with him, alone, or in company, and to that end he must often unhood and hood her again. In nine nights the Faulconer ought not to let his Hawk *jouk* at all, nor suffer her to pearch, but keep her during that time continually on his fist. When the Faulconer would call his Hawk, let him set her on the pearch, unhood her and show her some food within his fist, call her so long till she come to it, then feed her therewith: if she come not, let her stand *without food* until she be very sharp-set. Observe this order for about nine days."

Firstly, the *Passage Hawk*. If you will kindly hark back, you

Table conteyninge all the Hawkes which I tooke att the cliffee from 1604 (the yeare when I came of age) wth the moueths and days whereon I tooke them, and the sexe or kinde, whereon Ram: stands for Ramage, Hag: for Hagard.

	Ao.	September.	October.	November.	December.	Jaunuarye.	Februarye.	March.
1.	1604.	—	—	—	3°. Ram: falcon.	—	—	—
3.	1605.	—	—	2°. Ra: falcon.	3°. Hag: falcon.	—	—	—
4.	1606.	—	—	12°. Ra: falcon.	—	—	—	—
8.	1607.	—	20°. Ra: falcon.	28°. Ra: falcon.	—	11°. { Ram: falcon. Hag: tassel.	} Note:—Were taken bothe in one night.	—
10.	1608.	29°. Ra: falcon.	6°. Ra: falcon.	—	—	—	—	—
12.	1609.	—	—	6°. Ram: tassel.	3°. Ram: tassel.	—	—	—
13.	1610.	—	—	21°. Hag: falcon.	—	—	—	—
14.	1611.	—	9°. Ra: tassel.	—	—	—	—	—
16.	1612.	—	—	—	4°. Ra: falcon.	4°. Ram: tassel.	—	—
20.	1613.	—	—	19°. Hag: falcon.	24°. Hag: falcon.	19°. Ram: tassel.	7°. Ram: tassel.	—
21.	1614.	—	3.° Hag: tassel.	—	—	—	—	—
23.	1615.	—	—	13°. Ram: tassel.	—	—	—	3°. Ram: falcon.
25.	1616.	—	—	—	—	8°. Ram: falcon.	9°. Ram: tassel.	—
27.	1617.	—	—	11°. Ram: falcon.	—	23°. Ram: falcon.	—	—
29.	1618.	—	—	20°. Ram: falcon.	—	5°. Ram: tassel.	—	—
31.	1619.	—	—	—	23°. Ram: falcon.	—	25°. Ram: tassel.	—
32.	1620.	—	—	21°. Ram: falcon.	—	—	—	—
0.	1621.	—	—	—	—	—	—	—
33.	1622.	—	—	21°. Ram: tassel.	—	—	—	—
35.	1623.	—	—	—	—	3°. Ram: falcon.	17°. Ram: falcon.	—
36.	1624.	—	—	—	—	—	19°. Ram: falcon.	—
38.	1625.	—	27°. Ram: tassel.	—	—	2°. Ram: falcon.	—	—
40.	1626.	—	—	—	6°. Ram: tassel.	1°. Ram: falcon.	—	—
41.	1627.	—	—	—	—	17°. Ram: tassel.	—	—
42.	1628.	—	—	9°. Ram: tassel.	—	—	—	—
43.	1629.	—	—	2°. Ram: falcon.	—	—	—	—
45.	1630.	—	—	—	—	—	8°. Ram: falcon.	1°. Ram: tassel.
47.	1631.	—	—	16°. Ram: falcon.	28°. Ram: tassel.	—	—	—
0.	1632.	—	—	—	—	—	—	—
49.	1633.	—	—	28°. Ram: falcon.	—	15°. Hag: falcon.	—	—
50.	1634.	—	—	—	—	—	12°. Ram: tassel.	—
52.	1635.	30°. Ram: tassel.	—	—	—	25°. Ram: falcon.	—	—
55.	1636.	—	28°. Ram: falcon.	—	18°. Hag: tassel.	1°. Hag: falcon.	—	—
57.	1637.	—	—	8°. Hag: tassel. 11°. Hag: falcon.	—	—	—	—
60.	1638.	—	24°. Ram: falcon.	14°. Ram: tassel.	27°. Fresh hag: falcon.	—	—	—
0.	1639.	—	—	—	—	—	—	—
61.	1640.	—	—	5°. Entermewed hag: falcon.	—	—	—	—
64.	1641.	—	2°. Ram: falcon tassell.	10°. Ram: falcon.	—	8°. Ram: falcon.	—	—
65.	1642.	17°. Entermewed hag: tassel.	—	—	—	—	—	—
68.	1643.	—	—	7°. Ram: falcon. 24°. Ram: falcon.	—	—	—	4°. Ram: falcon.
70.	1644.	—	—	—	—	11°. Entermewed hag: falcon.	6°. Ram: tassel	—
74.	1645.	—	2°. Entermewed hag: falcon. 30°. Ramage falcon.	5°. Ram: falcon.	—	27°. Ram: falcon.	—	—
75.	1646.	—	—	—	—	27°. Ram: falcon.	—	—
78.	1647.	29°. Entermd. hag: falcon.	—	—	6°. Sore falcon. 27°. Sore tassel.	—	—	—
80.	1648.	—	—	—	—	12°. Ram: tassel. 18°. Ram: falcon.	—	—
82.	1649.	—	27°. Ram: tassel.	—	13°. Ram: falcon.	—	—	—
83.	1650.	—	—	4°. Sore falcon.	—	—	—	—
85.	1651.	—	—	—	6°. Ram: falcon.	27°. Ram: falcon.	—	—
0.	1652.	—	—	—	—	—	—	—
87.	1653.	—	19°. Hag: falcon entermewed.	—	—	16°. Hag: falcon.	—	—

Copied from a Note Book in the handwriting of Sir Hamon Le Strange, of Hunstanton, Knt., preserved in "the Evidence Room," at Hunstanton.

will remember we left the newly-caught Peregrine in the sock, lying on the floor of the hut. The bird is in this confined state taken to the Falconer's home, and at once jesses, swivel and leash are put on, and it is fastened down on a soft turf hillock, everything around being also made soft with fine sand. Some old Falconers instead of the *swivels* use *varvels*, that is, silver rings on the end of the jesses, through which the leash is passed; personally I prefer the swivel, as I think it lessens the chances of twisting. The Passage Hawks having always dreaded men, are at first very wild, and should be taken on hand very quietly, or they will never become good Hawks and have confidence in the Falconer. When first taken on hand, the Falconer and his assistant should keep the Peregrine there most of the first and second day, and well into the third night. There is every chance of the Falcon not feeding for some two or three days, so the next day take her into a dark room, into which only a slight gleam of light is allowed to enter. Put a nice piece of fresh beef (free from fat and skin) on the glove, and just touch her toes: this will make the Falcon pick down at the beef, and although she may not then swallow the pieces she picks off, she will probably do so next day unless very wild. After she has fed a few times through the *rufter*, hood and unhood her frequently in the presence of men, horses, etc., but *never* upon a full crop, for bating on a full crop is most injurious. When made to the hood, let her have the leg or wing of a fowl to pull at in the daylight. The field hood may now be used, but do not attempt to hood or unhood quickly, or you will have a *hoodshy* Hawk. Bells may now be put on, and the Falcon placed in the mew on a pole running lengthways about 3 ft. 6 in. from the ground, the pole being covered with carpet nailed wrong side outwards, and a piece of coarse canvas hanging from the pole downwards, so that should your Falcon bate off she will have no difficulty in recovering her seat. The Falcon must first be taught to jump to hand. This is done in the mew when she is sharp-set, by offering her a piece of fresh meat in the glove: she will soon come, when you must reward her with a small piece every time. After a few days carrying and handling, the Passage Hawk should be held by the assistant, with a long light water cord, known as a *creance*, attached to the swivel, the leash having been removed. The Falconer draws off some sixty yards away, up wind, having a live Pigeon on a lure line. The

braces of the Falcon's hood having been slightly slackened, the Falconer throws up the Pigeon, the assistant at the same time removing the hood, but on *no account* casting off the Falcon unless he sees she has 'spotted' the Pigeon. Should she kill, feed her up well on it, walking close to her, but by no means making any sudden movement, but going gently in to her, assisting her to feed. When half fed, take her quietly on hand and let her finish, then gently hood her, allowing her to take a few pieces after she is hooded. In this stage of training the difference between the Passage and Eyess will be seen, viz., how well the former will foot the Pigeon, whilst I have seen an Eyess Tiercel quite unable to foot even a dead one, having to be entered several times before he had any idea of footing the live lure. Of course the Passage Hawk having had to kill for its subsistence, is naturally an adept at binding to either quarry or lure. The Eyess having been fed at hack on a horizontal platform (an old door is as good as anything) on which the meat is tied, knows nothing of footing a live pigeon. If a few pigeons were given during the latter period of an Eyess being at hack, I am sure it would lessen the Falconer's work in training. It is necessary to bear in mind when hacking Hawks, that Peregrines and Merlins cannot be hacked together, or the latter are sure to provide a crop for the former ere long.

Waiting On.

Falcons used for Grouse, and Tiercels for Partridge and Woodcock, must be trained to *wait on*, to circle round and round the Falconer, and follow the line of walkers. The greater the height to which they mount the better, in order that they may be well placed when the quarry is flushed; for it must be remembered that Grouse and Partridges are seldom killed, except in the stoop, when the Hawk is able to strike, or bind on to them from above. The upper cut with a very fast Tiercel sometimes results in a kill, but not often. This much to be desired power is not easily taught, in fact some Falcons and Tiercels *never* acquire it, or only to a very limited degree, and so fail to become Game Hawks.

You will remember we left the Passage Hawk or Eyess so far on in its training, that it had flown with the creance, and killed and fed upon a Pigeon thrown up by the Falconer. The assistant again takes the Hawk on hand without a creance, the leash and

swivel being removed, and the Falconer draws away some hundred yards up wind, with a live Pigeon on a lure string. The assistant unhoods and casts off the Hawk as soon as the Pigeon is well on wing: the Hawk then stoops, and the Falconer suddenly pulls away the Pigeon, the Falcon or Tiercel misses its lure and throws itself upwards; again the Hawk stoops, and again the Falconer draws the Pigeon away, putting it inside his coat, but this must not be repeated too often, or the Hawk is apt to become disheartened and "rake away." These lessons much assist the Falconer in getting his Hawk into wind and hard muscle. When the Hawk will wait on for some time and kill the Pigeons well, wild Quarry may be looked for. An open country with large fields and no trees is the best, but on *no account* put up your Hawk unless you have marked some quarry down, for to disappoint a young Hawk at the first venture is bad work indeed; and to prevent this you must have a brown Pigeon, or, if possible, a Partridge, to take him down with. Having marked your birds down, put your Hawk on the wing, giving him time to get to his pitch, then walk the turnips or whatever the cover may be in line, the same as in Partridge shooting, the Falconer being midway in the line. Some use a staunch Setter to find the birds, but I work Fox Terriers. Doubtless a Setter looks better in the field, and for Grouse is indispensable; but I, in my Partridge hawking, have so many puts in in grassy or rushy banks, that no Setter could put them out, and even if successful, he would soon become too unsteady by the "hark forward."

Should a loud "whoo-whoop!" follow on a "who ha-ha-ha" (which is the Falconer's cry when the quarry is flushed), feed up on the Partridge; going home well content at having tasted the "Sport of Kings."

The Merlin is also obtainable from the northern moors, where they nest on the ground sheltered by the heather. These charming little birds are the smallest of our long-winged Hawks. They are very delicate, and when first taken up from hack should be fed twice or thrice a day, and in fact, when in training, a Merlin requires just a little piece of sheep's heart in the early morning should you intend flying it in the afternoon. Great care must be shown in being sure that the food is perfectly fresh, and never feed in the morning until the Merlin has cast. They are as a rule entered at live Larks, but I have flown a Merlin at them without

previous entering, and on one occasion I kept a Merlin through two moults, and lost her in the third. I always give away my Merlins at the end of the season or let them fly, they being useless as intermewed Hawks.

A flight with them is very interesting. The Lark rings upwards, and the Merlins, for they are flown in casts, follow quickly, taking wider rings to get above their quarry. I well remember a grand flight in this county at a strong Lark on a lovely September day, a light south-west wind, a deep blue sky, with here and there a few fleecy clouds drifting slowly along. The Lark went up at a great pace and also the Merlins, until at last the trio were lost to the view of the best sight of the party. In a few moments two blacks spots were seen rapidly descending, the larger proved to be the better Merlin *bound* to the Lark, the lesser the other Merlin closely following the quarry and its companion in flight to the earth. I would strongly advise any would-be Falconer to commence with the Merlin.

Goshawk and Sparrow Hawk.

I now come to the Hawks, known to the Falconers as the "short-winged," or those flown from the *bolt* or *fist*, which are represented by the Gos and Sparrow Hawks, the latter being generally hacked in a room, though sometimes at large. Any one living in an enclosed country may have delightful sport with a cast of Goshawks, but they cannot be flown at the same time or they will *crab*. The male will take Pheasants well, also Rabbits and Waterhens; and Captain Salvin mentions an instance of a male Gos, the property of a Mr. Birch of Wretham, Norfolk, which could take old Partridges. The female will take Hares, Rabbits, Pheasants (if well placed), Waterhens, and Squirrels. My own Gos, "Shadow of Death," a female, has taken Hares, but I consider it unwise to fly at them, for when the Gos is firmly bound on the neck of the quarry, the frequent and powerful kicks of the Hare are apt to seriously injure the wings of the Hawk. Captain Salvin, to whom I have already referred, has a female Gos called "Agrippa," and with her he has taken four hares in one day. Rabbit hawking is *very* good sport, and they are no doubt the best quarry for old "Shadow of Death." To convey to your mind the reason why the Gos was kept in so many country houses in the fifteenth and sixteenth centuries, I will give you the total amount

of the quarry killed by my Gos for the last three seasons, also her bag on one or two individual days; viz.

1886—1887	—	—	179 Head.
1887—1888	—	—	151 „
1888—1889	—	—	86 „

On 22nd September, 1887, at Docking, four Rabbits, two Pheasants. 31st December last year, at Bishop's Stortford, six Rabbits *in thirty-five minutes*

The following short extract from the 'Household Accounts of Hunstanton Hall in 1538' I am enabled to give through the kindness of Mr. Hamon le Strange:

"1538. August 22nd, 40'- was paid to bye ye Goshawk.

1535. January 28th, allowed Raffe Outlaw for Hawk meat, 11d.

1539. January 22nd, delivered you when you went Hawking with my uncle Roger Woodhouse, 7'6."

The training of a Gos differs in many points from that of the long-winged Hawks, principally in the fact that they are not required to wait on (neither indeed could they). When the Gos has become quiet on hand, which is better taught by candle light, she must learn to jump to fist. To do this, fasten a short creance to the swivel and place the Gos on the perch, taking a piece of beef in the glove, the Gos being sharp-set. She will not probably jump very far at first, but the distance can be increased gradually day by day, until she will fly to hand at a distance of fifty yards. Be sure to reward her with a mouthful every time, and do not make her come too often. She may now be entered at Rabbits, one or two of which are easily obtained, and I think the following method will be found a practical and natural one. Dig a hole in a grass field and place in it a Rabbit, covering it over with a turf, to which is attached a light cord; the turf being pulled away the Rabbit bolts, and the Gos if in "Yarak" will take it. Kill the Rabbit and allow her to feed upon the head, as it encourages her to foot her quarry there. I have frequently seen a Rabbit escape if footed on the hind quarters. The great trouble in training the Goshawks is their temper, although I am convinced that these Hawks become more attached to the Falconer than any other; yet should some Goshawks be disappointed in their first flight, they will take stand on a tree, and no lure will bring them to the fist. It is not always easy to know when a Gos is in Yarak, but when she rouses on the hand and the crest feathers stand erect, whilst a cruel expression

appears to come into her eye, you may be sure she will fly, but by no means attempt to fly her should she shut all her feathers in close.

I regret to say "Shadow of Death" is quite upset and frightened at the sight of a lady's dress. One would have thought that in her third season she would have recovered from such bad taste. I never hood my Gos except when travelling, so it will be seen at once how necessary it is to carry a Gos and get her accustomed to men, dogs, horses, children, etc. It is a matter of surprise to me that even in these days of "*big bags*" a Gos is not kept in many country houses, for apart from the sport of a morning's walk with this Hawk, the Leverets, Rabbits, and Pheasants are far preferable for the table, there being no smashed bones, or chilled shot, to put one's teeth on edge in quarry killed by the Gos.

Sparrow Hawk.

The Sparrow Hawk is easily obtained from the nest, but not so easily reared, it being very subject to cramp and later on to fits, especially if taken too young. Alfred Frost has had two instances in which the Sparrow Hawk, after several successful flights, has fallen from the fist and died in a fit. It is trained much in the same manner as the Gos, and is never hooded except on a journey. As far as I know it feeds exclusively on birds, and requires much more careful handling than the Gos, as it cannot stand half crops or coarse food. Like the Goshawk it is flown from the fist, at least in this country, but in the East it is thrown from the right hand, and so used to this do they become, that my brother Falconer, Captain C. Thompson, tells me that he has had an Indian Sparrow Hawk which would chatter when held as though it knew a flight was at hand. Considering how much the Peregrine dislikes even having its feathers *stroked*, the Sparrow Hawk's quiet manner when *in* the right hand is very remarkable. Captain Salvin states that in *Wallachia* the natives take large numbers of Quail with this little Hawk, in fact tribute was paid to the "Porte" in the Quails taken in this manner. Good sport may be had in an enclosed country with the Sparrow Hawk, as they will take Blackbirds and Thrushes, indeed, so impetuous are they in their flight, that instances have been noted of their entering so deeply into a thorn bush in pursuit of their quarry, as to necessitate their being cut out before they could again be taken on hand.

The Mew.

A horse without a stable is a white elephant to its owner: so also a Hawk without a mew, or at least a room or shed which can be converted into one. The mews at Charing Cross were established in 1377 by Richard II., and used until 1537, when in the twenty-seventh year of Henry VIII.'s reign they were converted into stables. The fact of the public stables in London being now known as "mews" is, Blaine considers, undoubtedly traceable to the same places in many instances having originally been utilized for the moulting and training of Hawks. The word *mew*, I may mention, is derived from the Latin *muto*, I change. I have had three mews in my time. The first was a summer-house—a damp place, and damp is fatal to Hawks, especially Merlins. The second I built of brick with a thatched roof, and facing the south. The thatch I found both warm in winter and cool in summer. The floor, which must be of wood, should be placed 18 in. above the ground, free passage of air being ensured beneath by fixing air bricks in the walls; the window should be made with two horizontal sashes, one fixed; parallel with the window, wooden sliding shutters are fixed inside in such a manner that, whilst admitting air, light is *practically* excluded. My present mew is part of a brick building, and measures 18 ft. by 11 ft. by 10 ft. in height, but I consider 7 ft. to the wall plate high enough. The perch runs lengthways 3 ft. 6 in. from the floor, having some Hessian hanging from it, the object being to enable the Hawks to regain their pole should they bate off. The perch is 2½ in. in diameter, and covered carefully with carpet, the web side outwards. On the floor, about 2 ft. 6 in. on either side of the perch, raised wooden ribs 2 in. high are nailed running parallel with it: between these, dry, clean sand is placed, for it is by keeping this sand free from castings and mutes that the Falconer knows if his Hawks are in health. A block for chopping meat should be placed in one corner, and above this a lanthorn. A few shelves and plenty of hooks on the back of the door should assist the Falconer to prove the old adage, "*a place for everything, and everything in its place.*"

Weathering.

To keep Hawks in health they should, when it is fine, be placed on a block on the grass in a sheltered, and, if possible, sunny spot.

I have mine on the lawn, with a wire protection to keep off strange dogs, etc. In each corner of this square space is a bath, for making which nothing is better than the end of a cask cut off about nine inches from the end, and sunk level with the grass, bearing in mind that Hawks when training should have the opportunity of a bath in the forenoon, so that they may prune, and all their feathers be dry ere sunset.

Before concluding, let me thank you for the patient hearing you have given to my disjointed paper. In the space of an hour it is almost impossible to do more than *glance* at this grand sport. Apart from the well-known Falconers of the present day, I here and there see signs of others being "lured" up. Permit me to offer them one hint—do not attempt a Peregrine in an enclosed country, and do not keep more than a cast of Hawks to begin on, for any Hawk must (in the season) be flown frequently to attain excellence. I would earnestly beg collectors to be content with *one* specimen of a Peregrine's egg, and not, as one that I know of, who collects numbers, in order to obtain, if possible, all the different shades and markings. Now and then a trained Hawk will rake away after a Wood Pigeon, and be for the time lost, simply because it cannot see the lure; but when a keeper, or any one in fact, is able to approach within gunshot of a large Hawk, he may be sure it is a trained one, even should he not hear the bell or notice the jesses, and therefore he should, if from no higher motive, remember, that a Peregrine when dead is worth about five shillings, but that a Falconer will gladly give four times that sum even to *hear* of the Falcon if alive.

In these days when our medical advisers are constantly reminding us that our manner of living requires "*plenty of open-air exercise*," and letters are appearing in a leading sporting paper, complaining of the great want of a sport which will enable the rising generation to obtain this "*without danger*," Falconry steps forward to fill the gap, and with the highest claim to consideration, for he who would be a Falconer must perforce consult nature's demands on more than mere *physical* grounds, as to attain to excellence in this, perhaps the oldest sport, calls for the exercise of *patience*, *gentleness*, and, above all, *control* of temper.

GLOSSARY.

Bate.	To flutter off the fist, block, etc.
Bewits.	Straps of leather by which the bells are fastened to the legs.
Bind.	To fasten on to the quarry.
Bolt.	To fly straight from fist at game as Goshawks and Sparrow Hawks do.
Cast.	Two Hawks.
Castings.	Feathers, fur, or tow, given with meat to cleanse the gorge.
Crabbing.	Hawks seizing each other.
Creance.	A long string.
Enter.	To fly the Hawk at quarry for the first time.
Eyess.	A Nestling Hawk.
Eyrie.	The breeding-place.
Falcon.	The Female Peregrine *par excellence*, or Goshawk.
Hack.	The state of liberty in which young long-winged Hawks are kept for some time before training. Short-winged Hawks are never *hacked*.
Hack-board.	A platform on which Hawks at hack are fed.
Haggard.	A wild caught mature Hawk.
Imping.	Mending broken feathers.
Intermiewed.	When a Hawk is moulted in confinement.
Jack.	A Male Merlin.
Jesses.	Leather straps fastened to the legs of Hawks by which they are tied.
Leash.	The leather thong by which the Hawk is tied to perch or block.
Lure.	The instrument by which Hawks are attracted to the Falconer.
Mew.	To moult; also the place in which Hawks are kept.
Mutes.	The droppings of a Hawk.
Ostrager or Ostrigier.	Ancient name given to trainer and user of Goshawks. Derivation, *Ostereus* or *Austereus*, old Latin for a Goshawk.
Passage Hawk.	A wild Hawk taken on passage or migration in immature plumage.
Pitch.	The height to which a Hawk rises in the air.
Prune.	When a Hawk arranges its feathers.
Pull through Hood.	To eat through the aperture in front of hood when on.
Put in.	Is when quarry is driven to cover.
Quarry.	The game flown at.
Rufter-Hood.	An easy hood, used in training wild caught Hawks.

Seeling.	An old method of obscuring the sight of a Hawk, which is now obsolete in this country.
Sharp-set.	Very hungry.
Stoop.	The rapid descent of a Falcon from a height on to its prey.
Swivel.	Used to prevent jesses and leash from becoming twisted.
Tiercel.	Male Peregrine and sometimes Goshawk.
Varvels.	Silver ring at end of jess.
Waiting on.	The Hawk to soar in circles above the head of the Falconer in expectation of game being sprung.
Weather.	To place a Hawk in the open air.
Yarak.	An Eastern term, signifying when the short-winged Hawks are in hunting condition.

XI.

METEOROLOGICAL NOTES, 1888.

By Arthur W. Preston, F. R. Met. Soc.

Read 29th January, 1889.

January.

The year entered with severe frost, which, however, soon broke up and gave way for a few days to abnormal mildness—the thermometer rising to 53 and 54 degrees on the 8th, 9th, and 10th. The weather was foggy, cold, and changeable to the 25th, and after a gale on the 26th became extremely severe with heavy falls of snow to the month's close.

February.

The frost continued almost without intermission throughout this month, the degree of cold registered on the morning of the 2nd (9.6 degrees) being the lowest reading of the thermometer since January 26th, 1881. The mean temperature of the last nineteen days of the month was 31.7 degrees, or more than 8 degrees below the average; of the last eight days, 28.8 degrees, or 12 degrees below; and that of the month, 33.9 degrees, or 6 degrees below. There has been no February with so low a mean temperature since 1855. The same month, in the years 1827, 1838, 1845, and 1853,

gave a similar or lower mean temperature, and 1886 nearly as low; but the coldest February on record was in 1855, when the mean was as low as 28.5 degrees. Snow fell almost daily during the last sixteen days of the month under review, and the wind was almost persistently in the north and north-east.

March.

With the exception of the second week, this month was a continuation of the protracted winter weather which prevailed throughout February, and was even colder than the severe March of the previous year. Frosts occurred on no less than twenty-two nights, and snow fell on sixteen days, and by the close of the month the country was as sterile as in the depth of winter. The rain and melted snow brought up the total fall to over three inches, and the humid state of the atmosphere made the land completely saturated, "March dust" being conspicuous by its absence. The wind was almost entirely north-east and north-west, and was on most days of a most searching description. The ground was covered with snow from February 13th to March 6th and from March 11th to 21st. The snowfall of the 25th was one of the deepest of the winter.

April.

This was another exceptionally cold month, and the weather of the first, second, and fourth weeks was extraordinarily severe for so late in the season. On many mornings in the first week the ground was covered with snow, and the penetrating north-east winds of the first and last weeks will not soon be forgotten. The mean temperature of the month was the lowest recorded in this neighbourhood for fifty-one years, in fact during the last 118 years only in three (1771, 1782, and 1837) does there appear to have been so low a mean temperature registered in April. Vegetation was extremely backward, and had there not been three or four fairly warm days in the middle of the month no signs of spring whatever would have manifested themselves.

May.

This month was very dry with much bright sunshine, attended with cold winds and frequent ground frosts. The mean temperature,

although 2½ degrees higher than that of the previous May, was about 2 degrees under the average. The night temperatures were much the same as last year, but the day readings of the thermometer averaged about 5 degrees higher. It was the driest month of the year, and rain only fell on nine days.

June.

This was a remarkable month by reason of its great variations in temperature. The heat of the 3rd (85 degrees) was the greatest recorded in June for ten years past, whereas the maximum readings of the 5th, 18th, and 19th (52 degrees), and 30th (53 degrees) were, with the exception of June 17th, 1886, when 51 degrees was recorded, the lowest day temperatures in any June since 1871. The heat of the 3rd was the more remarkable as it was confined to a very small area, and whilst the inhabitants of East Anglia were enjoying a tropical temperature those of Aberdeenshire were experiencing a summer snowstorm with the thermometer standing at 41 degrees. The cold in the north soon extended southwards, as on the 5th the day temperature was 33 degrees colder than two days previously. The mean temperature of the month was about 2 degrees under the average, and about 2 degrees colder than the previous June, although 2 degrees warmer than June, 1886. A sharp thunderstorm occurred on the morning of the 22nd.

July.

The weather of July was of a most exceptional character. The mean temperature was as much as 5.4 degrees below the average, and looking through the records of the last 100 years only one July (1816) appears to have had a lower mean temperature. The day temperatures were most abnormally low, the thermometer not having touched 70 degrees till the 18th day, and the maximum for the month (73.6 degrees) seems to have been the lowest since 1802, whereas in 1887 the day temperatures in July exceeded 70 degrees on twenty-five days. The night readings were more like those of October than July, there having been no warm summer nights whatever. On the morning of the 8th the thermometer in the screen fell to 36.6 degrees, an unprecedentedly low reading for July.

The rainfall of the month was greatly excessive, nearly double the average, but, although there were several thunderstorms, happily the neighbourhood of Norwich was not visited by such terrific storms and floods as places near the metropolis. In some of the (usually) driest parts of Suffolk nearly 7 in. of rain were recorded. The constant humidity of the atmosphere may be illustrated by the fact that the returns given at 9 a.m. were 9 per cent. in excess of July, 1886, and 18 per cent. above July, 1887. The month was, in fact, as cold, wet, and ungenial as could well be imagined, and was very much in character with the same month in 1860 and 1879. The following table shows a comparison between the July of 1887 and that of 1888, and illustrates the uncertainty of our climate in the summer :—

	July, 1887.	July, 1888.
Temperature:		
Maximum	86.8°	73.6
Minimum	43.0°	36.6
Mean daily maximum	75.1	64.7
Mean daily minimum	53.9°	50.4°
Mean of month	64.5°	57.6
Mean daily range	21.2	14.3°
Mean at 9 a.m.	66.5°	58.8
Mean rel. humidity, 9 a.m.	65 p.c.	83 p.c.
Rainfall:		
Total fall of rain	1.22 in.	4.88 in.
Number of days with rain	12	26
Mean estimated amount of cloud (0.10)	5.0	7.7

August.

With the exception of the second week, which was fine, warm, and dry, the weather throughout this month was of a similar character to that which had so long prevailed, and was ungenial in the extreme. The rainfall, although excessive in some parts of the kingdom, was not nearly so heavy in the Eastern Counties as in July, and was, in fact, slightly under the average. The first and last weeks of the month were the wettest. Temperature, except from the 7th to 12th, and 24th to 26th, was low throughout the month, and on the morning of the 19th was only 6½ degrees above the freezing point. The mean of the month (58.2 degrees) was about a degree warmer than July, but 4 degrees below the average. Although it was not such an unprecedentedly cold month as July,

yet it appears that during the last 100 years August has only been as cold on four occasions (1812, 1845, 1860, and 1881), and colder twice (1817 and 1885).

September.

The first ten days of this month were cold and gloomy, with frequent rain. Afterwards the weather improved, and to the 28th genial skies and light easterly winds prevailed with but little intermission. Morning and evening fogs occurred at times, and were particularly dense on the 17th and 24th. A complete change of weather took place on the 30th, which was a winterly day with driving storms of cold rain from the north-west and a great fall in temperature. The mean temperature of the month, although 2 degrees higher than that of the previous September, was upwards of a degree under the average. The deficiency was, however, less than in any month since January.

October.

The prevailing features of October were the extraordinary coldness of the first week, the abnormal warmth of the last week, the long period (14th to 28th) without any rain whatever, and the unusual amount of bright sunshine. The mean temperature of the first week was 40.9 degrees, and of the last 53.3 degrees, the former being about 13 degrees below, and the latter 7 degrees above the average. That of the entire month was 4 degrees below the average, making the fifteenth month in succession with a deficient mean temperature. There was but little wind all the month, and a remarkable absence of gales.

November.

This month was abnormally mild, the mean temperature, which was 3 degrees above the average, being the highest recorded in any November since 1881. It was also notable as being the first month with an excess of temperature since July, 1887. The maximum of 60.2 degrees (which occurred on the 16th) is almost unprecedented so late in the month. Most of the rain having fallen by night, the days were unusually fine for the season, and there was a total absence of frost and snow. The night temperatures were, on an average, about 4 degrees higher than in October.

December.

The mean temperature of December was nearly 2 degrees above the average, the first week being exceptionally warm, with an excess of 10 degrees. There were some seasonable frosts in the middle and end of the month, but no snow fell. The rainfall of the month was very light (nearly half fell on Christmas Eve), and the wind was almost persistently in the south and south-west. The effect of the high temperature upon vegetation called forth comments in all parts of the country. Roses flowered almost as in summer, and a most extraordinary number of wild flowers were to be found in sheltered situations.

The Seasons.

The following table shows the mean temperature and rainfall for the four seasons in their order, and a comparison with the average :—

Seasons.	Temperature.			Rainfall.		
	1888.	Average.	Depart. from average.	1888.	Average.	Depart. from average.
	Degrees	Degrees.	Degrees.	Inches.	Inches.	Inches.
Winter (Dec. to Feb.)	35.5	38.7	—3.2	4.42	6.45	—2.03
Spring (Mar. to May)	43.5	47.5	—4.0	5.83	5.15	+0.68
Summer (June to Aug.)	57.7	61.3	—3.6	8.52	7.10	+1.42
Autumn (Sep. to Nov.)	49.3	50.0	—0.7	7.00	8.50	—1.50

Year.

From a meteorological point of view the year was one of the most extraordinary on record. From the middle of January to the 24th October there was scarcely a warm week, and from that date to the end of the year hardly a cold day. We had June days like those of December, and December days like June. The coldness of the first ten months was the more remarkable when the character of the three previous years is taken into consideration. In 1885 there were ten months with a mean temperature below the average, in 1886 nine, and in 1887 ten ; and as the last five months of the latter year were of this description it will be seen that with the close of October, 1888, fifteen cold months had occurred in succession, and thirty-one months out of the thirty-six months then unexpired had been below the mean. A research into the

records of the past shows that such conditions, although rare, are not altogether unprecedented. During the three years (1771 to 1773 inclusive) twenty-eight months were colder than the average, and between January, 1812, and December 31st, 1814, there were thirty such months. In more recent times there were twenty-seven cold months in the three years ending March, 1880. The year 1784 yielded as low a mean temperature as the twelve months ending July, 1888, the year 1879 even lower, and the last named year, with November and December, 1878, and January, 1880, gave fifteen consecutive cold months. The rainfall of the past twelve months was not so great as would be imagined. July was excessively wet, but the remainder of the summer, although very humid and unpleasant, was rather drier than the average.

It should be mentioned that at the end of March, the instruments from which the above observations were taken were removed from Thorpe Hamlet to their present position at Blofield, where they were subsequently inspected and tested by Mr. W. Marriott, Assistant Secretary to the Royal Meteorological Society, and were pronounced perfectly correct and reliable, and their exposure good.

1888.

Month.	Barometer. Highest.	Date.	Lowest.	Date.	Mean.	Thermometer. Highest.	Date.	Lowest.	Date.	Mean.	Hygrometer. Relative Humidity. 9 a.m.	Cloud. Estimated proportion 0—10.	Rainfall. Thorpe Hamlet. Inches.	No. of days.	Wind. Direction. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	Mean estimated force
Jan. .	30.70	18	29.34	31	30.184	54.0°	9	14.2°	30	36.8°	94	6.5	1.24	14	1	2	7	1	4	3	9	4	2.7
Feb. .	30.39	28	29.38	11	29.906	49.0	8	9.6	2	33.9	91	7.7	1.93	18	4	10	3	0	0	0	6	6	3.4
March	30.31	1	28.76	11	29.568	56.4	10	24.2	2	37.0	91	7.2	3.01	23	4	6	3	3	2	4	3	6	3.7
April	30.31	6	29.54	30	29.886	64.6	30	26.2	6	42.5	83	6.5	1.74	21	5	8	1	3	3	2	4	4	3.4
May .	30.46	11, 21	29.39	1	30.026	74.0	19	32.0	10	51.1	77	4.2	1.08	9	7	4	2	1	5	3	8	1	3.7
June .	30.26	1	29.50	29	29.918	85.0	3	41.8	14	57.3	85	6.3	1.52	17	4	6	4	2	4	5	3	2	3.0
July .	30.05	1 & 8	29.41	3	29.738	73.6	20	36.6	8	57.6	83	7.5	4.88	26	4	2	5	1	1	9	0	6	3.0
Aug. .	30.28	18	29.46	28	29.985	82.5	9 & 10	38.5	19	58.2	84	6.2	2.12	20	3	2	1	1	5	9	5	5	3.0
Sept. .	30.52	12	29.50	29	30.137	72.2	15	37.2	1	56.3	86	5.5	2.24	18	5	2	9	2	0	5	4	3	2.5
Oct. .	30.53	21	29.24	2	30.052	65.0	27	28.4	21	46.0	90	5.4	1.82	14	2	2	0	2	1	10	7	7	2.2
Nov. .	30.15	23	29.25	30	29.808	60.2	16	33.2	28	45.7	94	7.6	2.94	20	1	0	8	6	2	7	5	1	4.0
Dec.	30.48	12	29.16	22	29.984	54.0	4 & 5	24.8	31	40.3	96	6.0	1.13	13	2	2	0	3	9	9	2	4	2.2
Means					29.932					46.9	88	6.4											3.1
Extremes & Totals	30.70	Jan. 18th	28.76	Mar. 11th		85.0	June 3rd	9.6	Feb. 2nd				25.65	213	42	46	43	25	39	66	56	49	

XII.

OBSERVATIONS ON RAINFALL.

By Francis Dix.

Read 26th February, 1889.

Having taken the rainfall in South Norfolk for the last fifty years (at Dickleburgh about thirty-six years, and at Norwich fourteen years), I have prepared a table which shows the monthly average for each year during that time.

The average rainfall during the last fifty years, 1839 to 1888 inclusive, has been for the first six months 9.84 inches, for the last six months 14.58 inches=24.42 inches.

During this period three instances have occurred in which no rain has been registered in the month; namely, April, 1855, February, 1857, and September, 1865: the last was followed by a wet October, 6.67 inches rain.

There were twenty-four years with a rainfall above the average—eight years of 30 inches and upwards, viz.—

1841=30.65 ins. 1848=32.42 ins. 1860=30.00 ins. 1875=30.11 ins.
1877=31.44 „ 1878=32.80 „ 1879=32.06 „ 1882=33.34 „

There were twenty-six years with a rainfall below the average—seven years below 19 inches, viz.—

1840=18.86 ins. 1847=18.40 ins. 1855=18.25 ins. 1858 registered 18.64 ins.
1863=16.75 ins. 1864=14.21 ins. 1868=17.39 ins.

The two highest registers were 32.80 inches in 1878, producing the Norwich Flood, and 33.34 inches in 1882.

The two lowest registers were 16.75 inches in 1863, and 14.21 inches in 1864.

The monthly rainfall has been as low as 0.50 inch and under, thirty-one times in the fifty years.

1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month	7th Month	8th Month	9th Month	10th Month	11th Month	12th Month
2	5	2	5	3	4	2	1	1	1	0	5

Total 31 times.

Fifty Years' Rainfall in South Norfolk, 1839 to 1888 inclusive, registered by Francis Dix, $35\frac{3}{4}$ years at Dickleburgh, $14\frac{1}{4}$ years at Norwich.

Date.	1st Month Ins.	2nd Month Ins.	3rd Month Ins.	4th Month Ins.	5th Month Ins.	6th Month Ins.	7th Month Ins.	8th Month Ins.	9th Month Ins.	10th Month Ins.	11th Month Ins.	12th Month Ins.	First Six Months	Last Six Months	Yearly Total Ins.
1839	2.30	1.80	1.50	0.90	1.00	2.30	2.42	2.90	2.48	2.20	2.56	2.30	9.80	14.86	24.66
1840	2.37	0.74	0.60	0.12	2.60	2.04	2.20	0.90	2.82	1.30	2.97	0.20	8.47	10.39	18.86
1841	2.00	1.40	1.40	1.20	1.75	1.85	4.00	2.55	3.25	6.55	2.50	2.20	9.60	21.05	30.65
1842	1.54	0.95	3.20	0.63	1.50	2.68	2.17	1.65	3.60	2.28	4.00	0.76	10.50	14.46	24.96
1843	1.50	2.10	1.00	1.75	3.54	2.19	2.14	5.40	1.35	5.10	2.24	0.06	12.08	16.29	28.37
1844	2.25	2.90	2.20	0.29	0.44	1.79	2.70	2.68	1.24	4.22	3.15	0.30	9.87	14.28	24.15
1845	2.80	1.15	1.77	1.54	3.71	1.35	2.55	3.20	1.15	2.36	2.00	2.94	12.32	14.20	26.52
1846	2.45	0.65	0.88	4.10	0.96	1.08	1.55	2.67	1.65	2.62	1.70	2.02	10.12	12.21	22.33
1847	1.00	0.85	1.00	1.50	1.32	1.90	1.40	1.08	1.62	2.48	2.00	2.25	7.57	10.83	18.40
1848	0.92	2.80	3.40	2.58	0.30	4.04	2.70	2.84	4.68	5.04	1.52	1.60	14.04	18.38	32.42
1849	1.70	1.68	0.53	1.95	4.80	0.68	2.25	0.42	1.62	2.70	1.85	3.70	11.34	12.54	23.88
1850	2.00	1.15	0.72	2.05	2.45	0.80	4.45	1.68	1.34	2.42	2.00	1.68	9.17	13.57	22.74
1851	1.73	0.65	3.55	2.63	1.04	1.40	3.80	2.08	0.65	2.64	2.90	0.72	11.00	12.79	23.79
1852	3.00	2.20	0.27	0.60	1.23	2.00	1.24	3.48	3.43	3.62	4.02	0.10	9.30	15.89	25.19
1853	2.04	2.68	0.75	3.28	1.06	1.55	3.85	2.57	1.64	4.65	1.65	0.70	11.36	15.06	26.42
1854	1.50	0.95	0.95	0.87	3.06	1.35	1.75	4.55	0.62	2.65	2.90	2.90	8.68	15.37	24.05
1855	1.00	0.72	0.36	0.00	1.70	1.62	4.28	1.50	0.33	4.00	2.04	0.70	5.40	12.85	18.25
1856	1.50	0.80	0.30	1.00	2.65	0.80	2.07	1.65	2.80	2.25	2.65	1.48	7.05	12.90	19.95
1857	1.70	0.00	0.70	1.65	0.82	2.00	2.00	2.40	3.85	4.80	1.30	1.20	6.87	14.55	21.42
1858	0.30	0.45	0.55	1.50	2.15	1.00	4.14	2.50	0.75	2.80	1.00	1.50	5.95	12.69	18.64
1859	0.64	1.10	1.40	1.10	1.20	3.35	1.80	2.60	2.76	2.95	1.50	2.25	8.79	13.86	22.65
1860	2.00	1.67	2.75	0.95	3.80	4.68	1.85	3.83	2.20	1.68	2.54	2.05	15.85	14.15	30.00
1861	0.75	2.80	1.95	0.60	0.90	1.05	3.57	0.70	1.45	0.36	4.00	1.34	8.05	11.42	19.47
1862	1.50	0.96	3.60	0.65	1.75	2.25	1.47	2.50	1.50	2.45	15.0	2.30	10.71	11.72	22.43
1863	1.90	0.35	0.98	0.65	0.82	2.43	0.85	1.04	1.90	2.75	2.25	0.83	7.13	9.62	16.75
1864	0.70	0.75	2.52	0.27	2.00	1.25	0.70	0.95	1.56	0.96	1.90	0.65	7.49	6.72	14.21
1865	2.55	2.10	2.85	0.35	1.35	1.90	3.55	4.23	0.00	6.67	1.30	0.60	11.10	16.35	27.45
1866	2.46	3.40	1.05	1.35	1.58	2.46	3.07	1.70	3.80	0.53	3.15	2.10	12.30	14.35	26.65
1867	2.35	1.33	1.55	2.50	2.67	0.42	3.53	0.95	2.45	2.05	0.80	1.80	10.82	11.58	22.40
1868	1.80	1.00	1.80	1.10	0.65	0.65	0.24	1.35	1.40	1.80	1.30	4.30	7.00	10.39	17.39
1869	1.56	2.10	2.48	1.05	2.10	1.85	0.50	1.95	3.14	2.00	2.05	4.70	11.14	14.34	25.48
1870	1.07	0.60	1.47	0.60	0.50	1.00	1.85	2.65	1.58	2.90	0.88	4.25	5.24	14.11	19.35
1871	0.80	2.14	1.00	3.00	0.55	3.40	2.45	0.88	3.40	1.30	1.40	1.53	10.89	10.96	21.85
1872	2.13	1.00	2.40	2.10	1.73	2.62	3.80	1.86	2.03	2.80	3.70	2.82	11.98	17.01	28.99
1873	1.68	1.60	1.45	0.86	2.20	2.22	1.85	0.95	2.70	2.63	0.90	0.50	10.01	9.53	19.54
1874	0.90	0.80	0.65	1.05	0.55	2.30	1.02	1.88	3.64	1.25	2.66	2.75	6.25	13.20	19.45
1875	2.02	1.24	0.60	0.87	1.30	1.45	6.07	0.70	2.73	4.03	6.90	2.20	7.48	22.63	30.11
1876	2.38	3.15	2.45	2.98	0.53	1.81	2.20	1.55	4.90	1.05	3.04	3.80	13.30	16.54	29.84
1877	3.04	2.62	2.74	2.30	1.65	1.46	3.10	4.35	3.08	1.83	2.57	2.70	13.81	17.63	31.44
1878	2.07	1.05	1.20	1.26	3.90	1.44	0.75	5.94	2.41	2.01	8.45	2.32	10.92	21.88	32.80
1879	1.18	3.53	0.97	2.55	2.23	3.20	5.33	5.14	3.45	1.00	2.65	0.83	13.66	18.40	32.06
1880	0.13	2.04	0.92	1·42	0.54	2.81	4.78	2.40	2.25	4.73	2.22	2.30	7.86	18.68	26.54
1881	1.32	3.80	2.00	0.80	0.70	1.45	1.52	3.70	3.02	3.24	2.16	3.14	10.07	16.78	26.85
1882	1.97	1.72	1.22	3.07	1.55	3.27	3.02	1.65	2.47	6.50	3.05	3.85	12.80	20.54	33.34
1883	2.12	2.75	2.17	1.76	1.05	3.03	2.33	0.56	2.95	3.45	3.58	3.15	12.88	16.02	28.90
1884	1.50	0.50	1.30	1.74	0.84	0.34	2.45	1.00	3.05	3.08	2.08	2.48	6.22	14.14	20.36
1885	2.41	2.47	1.45	1.23	2.95	0.95	0.84	0.64	4.63	6.84	3.16	1.43	11.46	17.54	29.00
1886	2.65	0.30	1.38	1.35	2.44	0.46	3.88	1.90	1.76	3.14	2.70	4.12	8.58	17.50	26.08
1887	1.80	0.58	1.95	1.07	2.08	0.41	1.15	2.26	2.47	2.66	2.24	1.38	7.89	12.16	20.05
1888	1.20	2.20	3.10	1.56	0.90	1.00	4.24	2.20	1.88	2.11	2.80	1.10	9·96	14.33	24.29
Average	1.72	1.57	1.58	1.44	1.70	1.83	2.55	2.25	2.34	2.95	2.52	1.97	9.84	14.58	24.42

The monthly rainfall has been 4 inches and upwards forty-one times in the fifty years.

1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month	7th Month	8th Month	9th Month	10th Month	11th Month	12th Month
0	0	0	1	1	1	8	6	3	12	5	4

Total 41 times.

The average rainfall (at Tottenham, registered by Luke Howard, 31 years, and at Epping, by J. Squire, 7 years) from 1801 to 1838 was, first six months, 10.62 inches, last six months, 14.40 inches=25.02 inches.

The average rainfall in the East of England for eighty-eight years as above was 24.68 inches.

The average monthly rainfall for the first sixty years 1801–1860.

1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month	7th Month	8th Month	9th Month	10th Month	11th Month	12th Month
1.79	1.54	1.46	1.63	1.89	1.99	2.56	2.34	2.11	2.76	2.51	2.07

The first six months 10.30 inches. The last six months 14.35 inches. Total 24.65 inches.

XIII.

A FEW NOTES ON A SHORT VISIT TO ARRAN MORE AND THE NEIGHBOURHOOD.

By J. Young, F.Z.S.

Read 26th March, 1889.

Having had a week's nesting on Arran More at the end of May, 1888, a few remarks on the birds noticed may possibly be acceptable, mainly as confirming the excellent observations made by Mr. H. M. Wallis in 1886, and recorded in the 'Transactions of the Norfolk and Norwich Naturalists' Society' for 1887–8. The weather was cold and stormy, very unfavourable for getting about—indeed on one occasion I was nearly detained a prisoner on Arran More.

For a stranger the local nomenclature is somewhat perplexing. For instance the name "Booty" is applied both to the Black Guillemot and Manx Shearwater, whilst the former is often called

the Puffin—the name given to the Common Puffin being the "Red Nebbed Puffin." The Merganser is known as the "Wigeon," and the Chough often as the Raven, or the Red-billed Jackdaw.

During rough weather Gannets came "inside the islands," but do not breed there, and so do large flocks of Wimbrel on migration, the boatman informing me that they were "young Curlews." One of the most common birds on the bleak and treeless mainland is the Cuckoo, of which species a dozen might be seen in the short drive from Dunglow to Burton Port, and very tame they were too, sitting on the stone dykes within a few feet of the road, regardless of the passing cars. At Crohy Head a pair of Kestrels were breeding, and on a barn on the wayside a colony of Black-headed Gulls and some common Sandpipers were nesting. On Rutland Island I put up a Dunlin out of some long grass, uttering its breeding cry, cré-é-é. I found the nest, but it was empty. The bird is known as the "Plover" in contra-distinction to the "Sandlark" (Ring Plover), which breeds on the same spot. On an islet in an inland tarn I found two nests of the Black-headed Bunting built in the top of rank heather, fully eighteen inches above the ground, rather an unusual situation; chosen, I imagine, to be out of the way of the Otters, whose tracks were numerous. In the same out-of-the-way spot I found a Hedge Sparrow's nest and eggs.

The Heronry (if two or three nests are worthy of the name) mentioned by Mr. Wallis was still in existence in company with some Hoodies, whose destructive work could be seen in the numerous egg-shells (principally Wild Duck and Grouse) scattered around. I was shown a pair of Red-throated Diver's eggs, which had been taken just before my arrival. I did not observe any Starlings, Swallows, Swifts, Martins, Peregrines, or Eagles.

Perhaps the most remarkable feature of the bird life of this locality was, as observed by Mr. Wallis, the extreme tameness of the Corncrakes. Whether sitting on a conspicuous hummock, turning its head from side to side as it uttered its well known "crakes," or whether flitting across the road just in front of one, it seemed determined to be seen; indeed I may say that I saw more Corncrakes during that week than I have seen all my life in England.

CORRIGENDA.

Page 678, line 4. For *came*, read *come*.

" " 12. For *barn* read *lake*.

" " 33. For *Cornerakes* read *Cornerake*.

XIV.

A DAY'S BIRD'S-NESTING IN NORFOLK, WITH A FEW BIRDY NOTES ADDED.

By H. M. Upcher, F.Z.S.

Read 26th March, 1889.

You have asked me to write a paper for our Norfolk Naturalists' Society, but really I hardly know where to begin, or how to go on. On looking through my note-book, I am reminded of a most pleasant and instructive day spent in one of Nature's Paradises, which it is occasionally one's lot to meet with; but which no lover of nature can visit, without feeling his mind and thoughts elevated above the ordinary level of every-day life. The waters sparkled brilliantly under a bright sun, when, accompanied by a friend who had come to spend the day with me, I arrived at the head of the Mere. The first glance might have seemed disappointing to any one not acquainted with bird life; as, beyond a casual Coot or two bobbing up and down on the rippling water, nothing else was visible: but a closer inspection, especially when aided by the telescope, soon brought hidden treasures into view. Now all the rush-girt bays appeared tenanted with fowl, among which we could identify Tufted Duck, Pochard, Gadwall, Shoveller, Pintail, and Teal; while an inspection of the grassy bank on the south side showed a flock of some thirty splendid Mallard in finest summer costume, either enjoying *otium cum dig* in the sunshine, or preening themselves after their forty winks. It would be worth a long journey to see such a collection and variety of Ducks alone. But this was not all, for the reeds fringing the lake, as well as the belts near it, all teemed with bird life, and resounded with bird song. The Sedge and Reed Warblers flitted hither and thither, uttering their incessant harsh, jarring note, or pouring out their rapid song, as if there was not a moment to lose. The Nightingale and Blackcap, the Whitethroat and Willow Wren, a perfect chorus of songsters, filled the coppices near with music. The Snipe drummed overhead, and as we crossed a sedgy meadow, the Lapwings swept

round and tumbled over almost against us in their parental responsibility. Thus bright and lovely was Nature's page opened to us on 19th May, 1888. After feasting our eyes and ears we proceeded to search for nests. The spring had been so cold, that many of the Ducks had not commenced to lay; but we were lucky enough to find a good many nests of different sorts, amongst which, the following were the most interesting:—Gadwall and Teal, these birds were mostly sitting hard. Shovellers, some had already hatched, others sitting hard. Tufted Duck only just beginning to lay. Pochard had not commenced, or at all events we did not find a nest. Mallard, as these generally lay so far from the water, we did not come across many of their nests, but saw a few from which the young had already gone. A Dabchick's, with six eggs covered up with green weed, the nest itself looking only like a casual heap of weeds. Coots' and Water-hens' nests here and there. Three or four Black-headed Buntings in the reedy tussocks, each with five richly streaked eggs; and a Whinchat's in the dry grass on the higher ground. Surely Norfolk may be proud of providing such a day's entertainment. An attempt had been made to induce the Wigeon to stay, by turning out some pin-winged birds. The plan seemed as if it was going to succeed, for several birds remained on the water till well into May. But then the hereditary instinct became too strong for them, and they departed, it may be presumed, for the land of their birth. But another object of interest was still to be seen. In one of the cars grew a slender Thorn, wound round by an Ivy stem, and at the height of eleven feet it threw out a circle of branches interspersed with Ivy. The top of this a Pheasant had chosen for its nesting-place, and was sitting upon seven eggs. The bird was off when the keeper showed me the nest. I climbed a neighbouring tree, as the Thorn was not strong enough to bear my weight, and found the eggs were quite warm. What freak of nature could have taken her to such an altitude? and no Baldwin's parachute was then known, to conduct her infant brood in safety to the ground. The ground around was such as Pheasants love, and there was nothing to force her to seek an unnatural nesting-place.

From general notes throughout the year, I again observed the very great scarceness of Swallows and Martins. But in Scotland, in Aberdeenshire, Swifts were present in great numbers.

Have any of your readers ever observed them to make a sort of drumming noise somewhat resembling that made by a Snipe, only not quite so distinct. At the end of January, 1888, two Fulmer Petrels were taken at Cley-next-the-Sea. I procured one alive, and sent it to the Zoological Gardens, but, unfortunately, it did not live very long. There has been a remarkable absence of Fieldfares and Redwings, and this fact does not seem to have been confined to Norfolk. But in the severe weather the first week in February, there was a great migration of Redwings to the Norfolk coast. At Blakeney, for two days, a perpetual stream of them seemed to be arriving without any cessation, a curious occurrence at that time of year. At the same time there was a very large influx of foreign fowl on the coast. The lake at Holkham was, I hear, quite full of Wigeon about 4th and 5th of February. The Sand Grouse I need not mention, as their history is fully chronicled by others, further than to mention, that a flock of them remained unmolested close by here for several months: but I have not heard of them since the beginning of February. A white specimen of the Thick-kneed Plover (*Adisnamus*) was in this neighbourhood all the summer, and departed with the others. It will be curious to see if he returns this year. One in the ordinary garb remained till December. But I believe it is generally the case that one straggler stays very late. A pair of Wagtails reared two broods in the same corner of a blank window in this house last year. They have already been to look at the old spot. They are the common grey-coloured-looking Wagtails. But near them on the grass the other day sat a magnificent fellow, apparently a solitary bird, but gorgeously arrayed in black and white, the colours standing out quite in as marked contrast as they do in a Magpie. There is an interesting case of Wagtails in the South Kensington Museum, which contains a Pied and a White Wagtail which were killed breeding together. Our lamented friend, Mr. Henry Stevenson, told me he once purchased a bird alive, which he was positive was a White Wagtail. After keeping it for some time in his aviary it developed into a most undeniable Pied Wagtail. What about a clear and well-defined species after such cases as this? It is a point I am more than sceptical upon, and have not yet seen anything to convert me to the two species theory.

I am very glad to say that I have noticed an undoubted increase

in Crossbills this year. One was killed out of a flock in the summer, and brought to me by a neighbouring keeper, who did not know what it was. These birds had evidently bred in the neighbourhood. During the shooting, not once or twice, but repeatedly, I saw these birds in a great many different places. I only hope they may now get a firm hold in the county. My pen has wandered on to an inordinate length, and to conclude, let me mention one other case of scarceness this year, and that is, in the Grey Crows. I do not know that I ever remember to have seen so few.

XV.

NOTES ON THE HERRING FISHERY OF 1888.

By Thomas Southwell, F.Z.S.

Read 26th March, 1889.

The partial gleam of success which I was enabled to chronicle last year has not been sustained during the season of 1888, and to use the stereotyped phrase now become so familiar, the Herring voyage which came to a close in December last was literally one of the worst on record. Notwithstanding the larger number of fish landed and the brighter prospects at one period of the voyage, from a variety of conflicting circumstances the result was, as a whole, most unsatisfactory.

At Lowestoft the spring voyage as usual commenced in February. Early in the season very few fish were taken, and the prices realised were from 1/4 to 1/10 per hundred; in the next three months however, the quantities landed were very fair, and prices fluctuated sharply, as usual, according to supply. Taking the whole season through the prices were most unremunerative; in many cases only making 25/- to 30/- per last. The total to the end of May was 2035 lasts against 2302 lasts in 1887; the Yarmouth boats during the same period capturing 490 lasts.

The midsummer fishery, which takes place off Yarmouth and

Lowestoft from June to the middle of July, resulted very satisfactorily to all concerned, more especially to the Lowestoft boats, which are much more numerously engaged in it than those from Yarmouth; it was consequently continued a week or two longer than usual, nearly to the end of July, and is admitted to have been the best season experienced for several years.

From the home midsummer voyage the boats proceed to the North Sea off Scarborough, Whitby, etc., where the Lowestoft boats are in the habit of landing their fish fresh, whilst the Yarmouth boats as a rule bring their fish home salted. The fact of scarcely any demand existing at Lowestoft for that class of salted Herrings during August and September, consequent upon there being no export trade to the Mediterranean worth mentioning carried on from that port, causes most Lowestoft boats that run up with Herrings to deliver their cargoes at Yarmouth. This will explain the small returns from Lowestoft during the two months mentioned, as compared with those of Yarmouth. Speaking of the Mediterranean markets, to which by far the larger portion of Yarmouth herrings are consigned, I regret to say the returns show no improvement in price, and it is feared curers will not realise the hopes that, considering the falling off of the catch in the latter part of the season, they were justly entitled to indulge in. This trade, the mainstay of the Yarmouth Fishery, is entirely in the hands of foreign salesmen abroad, *i.e.* as far as the disposal of the fish in their markets is concerned, and to this cause, in some degree, it is thought the low prices sent home may be to some extent attributed. Efforts are now being made to get the duty taken off cured herrings exported to Italy. Pilchards have received that happy immunity, and I trust the Herring interest will be equally successful.

In October the real business of the autumn home voyage commenced in earnest, and all went fairly well for a time, the deliveries being excellent and the prices fairly remunerative: in October the deliveries at Yarmouth were 7537 lasts as against 4615 the previous year, and at Lowestoft they were 3633 lasts against 2053; but with the commencement of November, which should be the fisherman's harvest month, bad weather quite put a stop to the fishing. What few fish were brought in came to hand in bad condition and sold accordingly; added to which, the silting

up of the sand-bank at the entrance of Lowestoft Harbour assumed a serious aspect, and many of the boats from that port had to avail themselves of the Yarmouth fish-wharf. Notwithstanding this, the Yarmouth return for the month of November was only 5380 lasts against 7141 in 1887, and that of Lowestoft 2241 against 3953, thus, what is usually the best month for fishing, as well as that which yields fish of the finest quality, proved a decided failure in all respects. The fishing was virtually over very early in December, and the Scotch boats sailed away home, I fear barely paying their expenses. The total catch of the month for Yarmouth was only 1094 lasts against 2894 last season, and Lowestoft 672 lasts against 1307.

Such is a brief account of the progress of the voyage. Although it will be seen that the total produce for Yarmouth was 836 lasts in excess of that of 1887, with a falling off in the Lowestoft return of 201 lasts, it will be found that the figures do not at all give an adequate idea of the character of the voyage. Early in the autumn, during August and September, large quantities of fish were taken and of excellent quality, but as there were but few buyers present, owing to their working fishing stations further north, had it not been for the superior quality of the fish, they would have been unmarketable, as it was, the Scotch fishery having been very short, many of them found their way into the German market, and met with a fairly successful sale. Later on when the most remunerative part of the season should have arrived, the weather proved so bad that the Scotch boats were unable to fish at all, and the few Herrings landed by our own boats were in very bad condition, thus it happened that although at one period of the season the catch was some 4000 lasts ahead of last year's, the final result was most unfavourable.

One very peculiar feature of the season was, that the autumn Mackerel voyage off Lowestoft, in which a large number of boats are annually engaged from first week in September to middle of October, proved a most disastrous failure, and this for almost the first time since its commencement, which was some twenty years or more ago. No reasonable explanation can be given of the strange freak of the "striped beauties;" and, for the sake of all those concerned, it is sincerely to be hoped the like will not be repeated.

The loss to Lowestoft alone, I am told, will be some £20,000 at least.

The look-out at Lowestoft, notwithstanding their midsummer voyage having been a good one, must be very black indeed; and at Yarmouth, although a few fortunate boats may have made up well, such cases have been quite exceptional. About 740 Home and 442 Scotch boats, employing some 8100 men and boys, sailed from Yarmouth and Lowestoft.

It is, as I have said on previous occasions, a very difficult matter to arrive at anything like an average of the price produced by the Herrings landed, but I am informed by a boat-owner and merchant of great experience, that £8 per last would be something like a fair average.

I am, as on previous occasions, much indebted to Mr. A. L. Gowing for his kind assistance, also to Captain Massingham for the Lowestoft official returns. At Yarmouth, I regret the death of my late friend Mr. H. Teasdel; but Mr. Nutman, who has succeeded him as Corporation Accountant, has kindly furnished me with the returns from that port.

RETURNS OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1888.

		Yarmouth.			Lowestoft.		
		Lasts (13,200).	Thousands (1320).	Hundreds (132).	Lasts (13,200).	Thousands (1320).	Hundreds (132).
Spring	January					—	—
	February		—	—	5	2	9
	March	87	2	7	324	8	3
	April	299	8	7	1040	1	4
	May	103	3	—	665	5	9
Mid-Summer	June	18	3	1	135	5	1
	July	229	1		913	9	4
North Sea	August	2051	4	5	180	7	8
	September	2787	3	5	140	4	—
Autumn Home Voyage	October	7537	3	6	3633	2	2
	November	5380	8	—	2241	2	8
	December	1094	3	6	672	5	8
		19,589	1	7	9953	5	6
		9,953	5	6			
		29,542	7	3			

XVI.

SOME RECENT ADDITIONS TO THE NORFOLK AND NORWICH MUSEUM.

By Thomas Southwell, F.Z.S.

Read 26th March, 1889.

The chief feature in the history of the collection of local birds during the past year, has been the presentation by the executors of the late Miss Postle of a selection of thirteen cases of birds, from the collection of her late father, Mr. Jehoshaphat Postle of Colney. Perhaps the most interesting of these is a young male Bustard, which, although not one of the indigenous Norfolk race, was still killed in this county. Its history, as communicated by the late Rev. Edward Postle (through whom the collection passed, first into the hands of Mr. Henry Postle, of Little Witchingham, and finally into the possession of Miss Postle, of Thorpe, Norwich) to Mr. Stevenson, is thus recorded in the "Birds of Norfolk" (vol. ii. p. 30) :—"It was killed, I should say, in 1820, at Horsey-by-the-Sea, and was seen to come off the sea and to drop into a turnip field, where it remained till a farmer (a relative of a friend of my father's) got his gun and shot it. It thus found its way into my father's collection at Colney." Another bird, which has the additional interest of having been killed by the Rev. R. Lubbock, is a Stilt Plover; it was shot on the 9th of June, 1822, and will be found recorded in Mr. Lubbock's own words in "Yarrell's British Birds" (vol. iii. pp. 306—7, ed. 4). A Black-tailed Godwit in summer plumage, also an Avocet, are doubtless Norfolk killed, as both species bred here at the time Mr. Postle's collection was made. A Golden Oriole in very fine plumage, mentioned by Hunt in his list of Norfolk Birds, was shot in April, 1824, by Mr. J. Postle at Hethersett. Another interesting case contains a pair of the now rare pure *Phasianus colchicus*—so much has the Pheasant of our day, been crossed with foreign species, especially with *P. torquatus*, that it is only in collections made long ago that this bird is found at all free from cross. Not less interesting, from another point of

view, is a case containing a couple of Game Cocks, trimmed and spurred, one crowing over its defeated rival which lies dead at his feet; these birds were probably stuffed by Hunt (as many of the other cases undoubtedly were, as they bear his label), and the conqueror might have been, if indeed it was not, the original of the portrait of the Game Cock in his 'British Ornithology.' Unfortunately there is no catalogue of the collection, and there are no memoranda on the cases, and but for the information recorded by Mr. Stevenson in the 'Birds of Norfolk,' which he obtained from the family ere it was too late, scarcely anything would have been known of the history of interesting birds it contains. In addition to the birds there is a Marten Cat which Mr. Gurney remembers to have seen in the collection years ago, and which he thinks was probably killed in Brooke Wood, where this species was known to exist at the commencement of the present century.

Amongst the other more noteworthy additions to the British Birds, Lord Lilford has presented a unique Norfolk-killed specimen of the Roseate Tern (*Sterna dougallii*), shot at Hunstanton on July 12th, 1880; Mr. Edward Fountaine, two nestlings of the Snowy Owl, only fourteen hours old, hatched in his aviary at Easton, in July, 1888; and Lieut.-Colonel Butler, a nest of the Hawfinch built in the garden of Herringfleet Hall in a Cedar tree in 1888.

With regard to the rarer birds of prey I cannot do better than, as on a previous occasion, quote from the interesting remarks made by the President at the annual meeting. He said the Committee had been rather fortunate in 1888 in getting seven additional species, for the average of the last few years had not been more than four. The Hawk from Christmas Island (*Urospizias natalis*) was a great acquisition. That island, which was quite uninhabited and barely known, was recently visited for surveying purposes by H.M.S. "Egeria," on board of which as Naturalist was Mr. Joseph Jackson Lister, nephew of the celebrated surgeon. Mr. Lister discovered on the island this fresh species of Hawk, which came nearest to the Hawk of the Fijian Islands, but was nevertheless larger and distinct. The two specimens—one an adult female, and the other an immature female—Mr. Lister had been good enough to present to the Museum. They were also indebted to a very old friend, Mr. Samuel Bligh, for having obtained for them two

specimens of a very rare Ceylon Owl (*Phodilus assimilis*), which for some years they had been endeavouring to get. It was a remarkable genus, consisting of three species only. The Museum hitherto possessed two, but, thanks to Mr. Bligh's good offices, they had now the three complete. They had a rare Hawk from the interior of Venezuela (*Micrastur zonothorax*), which was sent to him by a correspondent in Paris, and of which he had never seen but the one specimen in the British Museum. Mr. Wills, a missionary in Madagascar, had sent them two species new from that island, one, a very rare Goshawk (*Astur henstí*), and the other an Owl (*Phasmoptynx major*) of the larger race of the short-eared Owl of South Africa; and Mr. Whitehead, who had lately returned from a remarkable journey in the East, had supplied them with two newly-discovered species of Owl, one (*Myrtha wiepkeni*) a fine species from the island of Palawan, north of Borneo, and the other a beautiful little Owl (*Heteroscops lucia*) discovered by himself on the lofty and almost inaccessible mountain of Kina Balu, in Northern Borneo.

Many objects of interest have been added to the various other departments.

XVII.

MISCELLANEOUS NOTES AND OBSERVATIONS.

Red-breasted Flycatcher at Scilly.—With reference to the Red-breasted Flycatcher (*Muscicapa parva*) killed on the islands of Scilly (vol. iv. p. 454), an important corroboration of its authenticity comes to hand from Mr. Thomas Cornish, the friend and partner of the late Mr. E. H. Rodd, with whom he was intimate for many years. He writes, August 6th, 1888: "Dear old Vingoe is dead, and your prognostication that we should have trouble in recovering our specimens with him has proved itself correct. You are all right in the specimen of the Red-breasted Flycatcher; I had several long talks with him about it. Having known well Smith the gamekeeper

at Trescoe, 1863–65, I am not surprised your specimen found its way into Vingoe's hands from the islands without being recorded by Mr. Rodd."

In addition to this evidence afforded by the extract from Mr. Cornish's communication here given, Mr. Vingoe put on a paper a statement that he received the Flycatcher in the flesh, and skinned and stuffed it.—J. H. Gurney, Jun.

Apanteles stauropodis, Marshall.—At the end of September, 1888, Mr. Thouless gave me a group of cocoons of an *Apanteles*, which had been formed by larvæ which had just emerged from the larva of the Lobster Moth (*Stauropus fagi*). On October 20th some of the parasites emerged. I could find no description of them: they appeared to come next to *A. octonarius*, Rtz. I therefore sent them to the Rev. T. A. Marshall, who decided they were new to science, and proposed the above name. He will describe them in 'Species des Hyménopteres d'Europe et d'Algerie,' vol. iv., which consists of the Braconidæ, and is being written by Mr. Marshall. *Stauropus fagi* seems to be very much infested with parasites. I have several species bred from this singular larva.—J. B. Bridgman, F.L.S.

Spiræa tomentosa and Sambucus racemosa.—These two foreign shrubs have both become partially naturalized in Norfolk. The former, which is very like the common garden shrub *S. salicifolia*, but has leaves downy beneath and flowers of a deeper rose colour, grows at Merton, in damp ground near Lord Walsingham's house, and has been sent to me by the Rev. H. Williams. The latter, the Red-berried Elder, from a plantation at Sculthorpe Fen, where it is believed to have been originally planted by the late Sir Willoughby Jones, has been sent by the Rev. E. W. Dowell.

Herbert D. Geldart.

FAUNA AND FLORA OF NORFOLK.

[Further Additions.]

XVIII.

HYMENOPTERA.

By John B. Bridgman, F.L.S., F.E.S.

Read 26th February, 1889.

Since the publication of "Additions to former List" (vol. ii. p. 617) in vol. iii., p. 367, but two fresh species have come under my notice, both Ants: one was taken by Mr. Thouless on Mousehold, and the other by myself on the trunk of an old tree at Earlham in 1888. This latter is a northern species, but found sparingly in the south. It is singular it should have escaped my observation so long, as the tree has been under observation for years in the hope of obtaining the three sexes of another Ant which lives inside. The species of the Bee *Sphecodes* are really not new, but formerly were mixed up with other species, but have been separated for minute differences.

ACULEATA.

Heterogyna.

Formicidæ.

Myrmica lobicornis. Fab. This rare species was taken on Mousehold by Mr. Thouless in 1886, who was struck with their unusual sluggishness, and brought them to me, being convinced they must be different from the commoner species.

Leptothorax acervorum. Fab. Neuters were taken from the trunk of an old tree at Earlham in 1888.

FOSSORES.

Pompilidæ.

Agenia hircana. Fab. This species was recorded in my former list as *A. bifasciata*, which species it had always been considered in Britain, till Mr. E. Saunders pointed out that our species really was *A. hircana*, F., and not the other, although very similar.

ANTHOPHILA.

Andrenidæ.

Sphecodes pilifrons. Thom. This species was mixed up with *S. rufiventris*, W. = *rufescens*, S.

„ similis. Wesm. This is another of the larger species.

„ ferruginatus. Schenck. I took one female at Brundall.

„ variegatus v. Hag. This and the following were mixed up with the small species *S. ephippium*.

„ dimidiatus v. Hag. Appears to be common.

„ affinis v. Hag.

„ puncticeps. Thoms. I have taken but one male of this species.

XIX.

LEPIDOPTERA.

By Charles G. Barrett.

Read 26th March, 1889.

The number of species of Lepidoptera in our County List is already so very large that it would be unreasonable to expect any extensive additions. Yet the past five years have been far from barren in this respect, and it is especially interesting to observe that, of the additions made, a large proportion are also new, or have but recently been added, to the *British* fauna.

I have again to thank old friends and correspondents for their assistance, and a more recent correspondent, the Rev. C. T.

Cruttwell of Denton, who has done a large amount of good work in that hitherto unexplored district. As usual a large proportion of the additions have been made by Mr. E. A. Atmore of King's Lynn, whose labours in the north-western part of the county are extensive and unremitting. As I have again become a resident, I have also been able to add a few species.

Diurni.

Hesperia comma. Linn. A single specimen has been secured by Mr. Atmore on the verge of the Chalk district, a few miles from Lynn.

Nocturni.

Deilephila euphorbiæ. Linn. I had the rare good fortune to capture a specimen of this beautiful Hawk Moth, hovering at blossoms of Verbena in my garden in August, 1887. This is one of our rarest British species, and was supposed to have become extinct.

Callimorpha dominula. Linn. Two specimens taken at Burgh, near Aylsham, by Godfrey Burr, Esq., are in the collection of the Rev. C. T. Cruttwell. This very handsome Tiger Moth is common in the Fens of Cambridgeshire, and has long been expected in this county.

Geometræ.

Tephrosia extersaria. Hüb. Taken at Foxley Wood by the Rev. T. H. Marsh in 1862.

Cheimatobia boreata. Hüb. I met with a single specimen sitting on a leaf of *Rhamnus catharticus* at the edge of a wood near Narborough in November, 1888.

Eupithecia plumbeolata. Haw. A single specimen has been taken by Mr. Atmore, in the town of Lynn. It is difficult to understand its appearance here, as its food plant is not found in the neighbourhood. A substitute plant may possibly be found in gardens.

„ isogrammata. H.-S. Also taken at Lynn by Mr. Atmore.

EUPITHECIA PIMPINELLATA. H.-S. I found several larvæ of this species feeding on *Pimpinella saxifraga* near Wells in 1887, from which the Moths were reared last summer.

" EXTENSARIA. Frr. My eldest son, when collecting for me on the coast in July, 1887, had the good fortune to capture a specimen of this excessively rare species—then hardly known, or believed, to be British. By dint of hard work he and Mr. Atmore secured several more. In September larvæ were found feeding on *Artemisia maritima*, and from these a fair number of specimens were reared last summer. Mr. Atmore then again saw the insect on the wing, and larvæ were again obtained by both of us, from which good hopes are entertained for next season. This is one of the largest and most handsomely marked of our *Eupithecia*, and is one of the most striking and interesting of our recent discoveries.

NOCTUO-BOMBYCES.

NOTODONTA TORVA. Linn. This is an even more startling discovery. The only known British specimen was reared by Mr. Frank Norgate from a larva found by him upon White Poplar in Norfolk. Several larvæ were found, and supposed to be those of *N. ziczac*, but only one was reared. *N. torva* is a very fine Moth. It was formerly reputed to be a British species, but was expunged nearly thirty years ago from the British list. Its restoration now is therefore most gratifying.

PYRALIDES.

PYRAUSTA PUNICEALIS. W.V. Taken by Mr. Atmore on the chalk at Ringstead.

" OSTRINALIS. Hb. I found this species sparingly last season on a wooded hill near Lynn.

Crambites.

Crambus salinellus. Tutt. I met with a single specimen in a salt marsh at Lynn.

Cateremna terebrella. Zk. This species is an addition to the British fauna as well as to the Norfolk list. It was captured by Lord Walsingham at Merton, among *Pinus cephalonica* and *abies*, and afterwards reared from the cones of the last named tree. Under his instructions I had the good fortune to find its larva near Lynn, and to rear several specimens. It is still a great rarity.

Phycis dilutella. Hept. Taken near Hunstanton by Mr. G. Balding, but very local.

Nephopteryx splendidella. H.-S. This has been quite recently separated (with some doubt) from *abietella*, from its larger size and darker and somewhat different markings, and particularly from the habits of its larva, which feeds in the cones of Spruce (*Pinus abies*), while that of *abietella* feeds in shoots of Scotch Fir (*Pinus sylvestris*) and sometimes in its bark. I had the good fortune to rear a fine specimen from a cone of *Pinus abies* brought from Merton in 1887.

Rhodophæa tumidella. Zk. This handsome species has been taken by the Rev. C. T. Cruttwell at Denton, and by Mr. Atmore at Lynn. I have also found, and reared, its larva.

Corcyra cephalonica. H.-S. Two specimens, which had doubtless emerged from among imports of some kind, were found by Mr. Atmore in one of the warehouses in Lynn Dock.

Tortrices.

Tortrix decretana. Tr. This handsome species has recently been recognized as occurring near Lynn. It is excessively local, but not scarce where it occurs, and, like the allied *Lafauryana*, appears to be absolutely confined to the county of Norfolk as far as the British Islands are concerned.

Sericoris littoralis. Curt. (littorana, H.D.) Found sparingly in salt marshes along the coast.

Bactra furfurana. Haw. Taken by Mr. A. Balding at Walsoken, near Wisbech.

Poedisca ophthalmicana. Hüb. A single specimen has been taken at Lynn by Mr. Atmore.

Halonota ravulana. H.-S. (obscurana. Steph!) I had the good fortune to secure a single specimen of this very rare species on a heath near Lynn.

Dicroramphia alpinana. Tr.

„ saturnana. Gn. Both taken near Lynn by Mr. Atmore.

„ acuminatana. Zell. I found this, not uncommonly, in Chalk-pits at Gayton.

Catoptria candidulana. Nolck. This I found in a salt marsh near Lynn, and have, in addition, found and reared its larva, which feeds on *Artemisia maritima*.

Eupœcilia affinitana. Dougl. Not very scarce in the salt marshes on the coast.

Cochylis inopiana. Haw. Not uncommon among *Inula dysenterica* in damp places.

Tineina.

Tinea merdella. Zell. In houses in Lynn.

Adela cuprella. Fab. This beautiful species has been found at Horning by the Rev. C. T. Cruttwell, and near Lynn by Mr. Balding and Mr. Atmore.

Cerostoma lucella. Fab. Taken at Denton by the Rev. C. T. Cruttwell.

Gelechia albipalpella. H.-S. Not very rare on Heaths near Lynn.

„ tetragonella. H.-S. Found in damp places on the coast, but extremely local. It is a species newly discovered in Britain and found in very few localities.

„ humeralis. Zell. (lyellella. Curt.) Taken at Merton by Lord Walsingham.

GELECHIA VICINELLA. Dougl. Of this very scarce species I met with a single specimen near Hunstanton last season.

,, SEMIDECANDRIELLA. Threlfall. This species, which has recently been discriminated from *maculiferella*, is not uncommon on the coast, and also on the Breck sand on a portion of the Merton estate.

,, PLANTAGINELLA. Stn. Recently discriminated from *instabilella*, and found to occur upon the coast.

,, SEQUAX. Haw. Found at Denton by the Rev. C. T. Cruttwell.

,, UNICOLORELLA? Believed to be distinct from *tenebrella*, and found to occur near Lynn.

,, LUCIDELLA. Steph. Taken at Merton: an exceedingly local species.

,, BIFRACTELLA. Mann.

,, INOPELLA. Zell. Both found among *Inula dysenterica* near Lynn.

NOTHRIS DURDHAMELLA. Stn. Larvæ found rather commonly near Swaffham upon *Origanum vulgare*, and reared.

PLEUROTA BICOSTELLA. Linn. On Heaths near Lynn, but not common.

BUTALIS FUSCO-ÆNEA. Haw. Taken near Lynn by Mr. Atmore.

,, FUSCO-CUPREA. Haw. Not scarce on the chalk near Swaffham.

GRACILARIA PHASIANIPENNELLA. Hüb. A single specimen was beaten from Alder by Mr. Atmore near Lynn.

COLEOPHORA PARIPENNELLA. Fisch. Near Lynn.

,, WILKINSONI. Stn. Near Lynn.

,, MAENIACELLA. Flet. In salt marshes on the coast.

,, POTENTILLÆ. Stn. Near Lynn. The last four species found by Mr. Atmore.

,, TRIPOLIELLA. Hkn. Very abundant among *Aster tripolium* in the salt marshes.

COSMOPTERYX DRURYELLA. Zell. Mr. Atmore has found the larva of this lovely little gem feeding on Hop leaves, and has succeeded in rearing it.

LAVERNA LACTEELLA. Stn. Taken at Denton by the Rev. C. T. Cruttwell.

„ MISCELLA. W.V. Taken at Ringstead by Mr. Atmore.

ASYCHNA ERATELLA. Zell. I swept up a single specimen of this brilliant little rarity in the neighbourhood of Swaffham last summer.

ELACHISTA BEDELLELLA. Sirc. Taken at Ringstead by Mr. Atmore.

LITHOCOLLETIS VIMINETORUM. Stn.
„ KLEMANNELLA. Fab.
NEPTICULA BETULICOLA. Stn.
„ PLAGICOLELLA. Stn.
„ PRUNETORUM. Stn.
„ CONTINUELLA. Stn.
„ LAPPONICA. Wk.
„ SORBIELLA. Stn.
„ CRYPTELLA. Frey.

All these taken, or bred, by Mr. Atmore, near Lynn.

ADACTYLA BENNETTII. Curt. Not scarce in salt marshes along the coast.

MIMESEOPTILUS PHŒODACTYLUS. Hüb. Found by Mr. Atmore on the coast, near Hunstanton.

FURTHER NOTES ON SPECIES PREVIOUSLY RECORDED.

THECLA W-ALBUM. Ill. The doubtful record of this species is now fully confirmed, as it has been found at Denton, Stoke Holy Cross, and Lynn.

POLYOMMATUS PHLŒAS. Linn. I took a remarkable variety of this species near Lynn in 1887. Its hind wings are entirely black, and the fore wings very broadly margined with the same, while the usual row of black spots is nearly obsolete.

SPHINX CONVOLVULI. Linn. This noble Moth appeared suddenly in August and September, 1887, in numbers all over the kingdom. At least thirty were taken in gardens in the town of Lynn.

DEILEPHILA GALII. W.V. Taken by the Rev. C. T. Cruttwell at Denton, 1888.

DEILEPHILA LIVORNICA. Esp. In the 'Naturalist' for 1857, p. 275, is a record of the capture of a specimen of this rare Hawk Moth by Mr. Garness at Thetford. There is no reason to doubt the authenticity of this capture, as it is guaranteed by the Rev. Joseph Greene. It has only recently come under my notice.

LITHOSIA HELVOLA. Ochs. (DEPLANA. Esp.) I have recently seen three specimens, which were taken at Cawston by the Rev. T. H. Marsh.

SELENIA ILLUSTRARIA. Hüb. Has both been reared and captured at Lynn within the past two years.

IODIS VERNARIA. Linn. Denton.

EUPITHECIA PULCHELLATA. Steph. Taken and reared near Lynn by Mr. Atmore.

,, PYGMÆATA. Hüb. Has been found rather commonly near Lynn by Mr. Atmore.

LOBOPHORA LOBULATA. Hüb. This has now been found near Lynn, but not commonly.

YPSIPETES RUBERATA. Frey. Also at Lynn, Walsoken, and West Walton.

MELANIPPE RIVATA. Hüb. Denton.

ANTICLEA DERIVATA. W.V. Denton.

CIDARIA PSITTACATA. W.V. Near Lynn, Mr. Balding.

CHESIAS SPARTIATA. Fab. Denton; common near Lynn.

NOTODONTA CHAONIA. W.V. Denton.

TAPINOSTOLA ELYMI. Tr. Apparently found in many parts of the coast.

MAMESTRA ABJECTA. Hüb. Not scarce on the coast near Lynn.

AGROTIS PRÆCOX. Linn. Hunstanton; rather common at Yarmouth in 1888.

CUCULLIA ASTERIS. W.V. I have met with this species, and also its larva, in Lynn.

HELIOTHIS ARMIGERA. Hüb. Taken near Yarmouth by Mr. F. D Wheeler.

HELIODES ARBUTI. Fab. Rather common near Lynn.

ACENTROPUS NIVEUS. Oliv. In plenty on Barton Broad, and on some ponds near Lynn.

EUDOREA BASISTRIGALIS. Kngs.
„ LINEOLA. Curt.
„ RESINEA. Haw.
} Denton. All three taken by the Rev. C. T. Cruttwell.

CRAMBUS ALPINELLUS. W.V. Occurs every year in the neighbourhood of Hunstanton, usually singly, but in 1888 several were taken.

„ CHRYSONUCHELLUS. Scop. Ringstead, very fine; also near Swaffham.

PERONEA PERPLEXANA. Bar. Taken at Lynn by Mr. Atmore.

PENTHINA CAPREANA. Hüb. Many specimens have now been reared or captured near Lynn.

„ PRÆLONGANA. Gn. Occasionally near Lynn.

SPILONOTA LARICIANA. Zell. Near Lynn.

„ ACERIANA. Mann. Denton.

„ NEGLECTANA. Dup. Denton.

SERICORIS BIFASCIANA. Haw. Thetford, Merton, Denton.

„ FULIGANA. Haw. (ABSCISSANA. Dbl.) This scarce and very local species has at last been re-discovered in Norfolk, Mr. Atmore having taken two specimens in 1888 near Lynn.

MIXODIA RUBIGINOSANA. H.-S. (BOUCHARDANA. Dbl.) This northern species appears to be extending its range southward. It has been taken near Thetford and Lynn.

„ RATZEBURGHIANA. Sax. This species appeared in the Lynn district in 1887, and was rather common in 1888.

EUCHROMIA PURPURANA. Haw. Taken at Denton by the Rev. C. T. Cruttwell.

CNEPHASIA POLITANA. Haw. (LEPIDANA. Curt.) Common on Heaths near Lynn.

PHOXOPTERYX DERASANA. Hüb. Lynn; scarce.

GRAPHOLITHA OBTUSANA. Haw. Lynn; rather common.

PHLÆODES DEMARNIANA. Fisch. This hitherto rare species has greatly increased in numbers in the last two years.

PÆDISCA OCCULTANA. Dougl. Lynn; Mr. Atmore.

COCCYX NIGRICANA. H.-S.

Coccyx distinctana. Bent. These very scarce and local species have both been found among *Pinus picea* near Lynn.

Carpocapsa grossana. Haw. Merton, Swaffham, Lynn.

Stigmonota coniferana. Rtze. Merton, Croxton, Shouldham.

„ weirana. Dougl. Merton.

Catoptria albersana. Hüb. Once near Lynn.

Xylopoda pariana. Linn. Denton.

Eupœcilia dubitana. Hüb. This species has now become abundant around Lynn, frequenting the common creeping-rooted Thistle (*Carduus arvensis*) in waste ground.

„ degreyana. Mc L. Has become very rare in its old haunts, but has been taken at Denton by the Rev. C. T. Cruttwell.

Epigraphia steinkellneriana. W.V. Lynn.

Scardia granella. T.L. Most abundant in granaries in Lynn, and even flying in multitudes about the adjacent streets.

Tinea misella. Z. Also in granaries in Lynn Docks.

Nemotois scabiosellus. Scop. Found commonly at Merton in 1888.

Plutella porrectella. Linn. Lynn, in gardens.

Harpipteryx nemorella. Linn. Near Lynn; taken by Mr. Atmore.

Enicostoma lobella. W.V. Gayton and Lynn.

Gelechia alacella. Dup. A single specimen of this rarity has been secured near Lynn by Mr. Atmore.

„ artemesiella. Tr. Common near Swaffham.

„ umbrosella. Zell. Abundant near Lynn.

„ scriptella. Hüb. Denton, not common.

„ maculea. Haw. Lynn.

„ tæniolella. Tr. Croxton.

„ cerealella. Oliv. Abundant about the corn warehouses at Lynn Docks in 1887.

Chelaria Hubnerella. Don. Lynn, Denton.

Harpella Geoffrella. Linn. Denton, Hingham.

Æchmia dentella. Stn. Lynn.

Peritia obscuripunctella. Stn. Lynn.

TINAGMA SERICEELLA. Haw. Lynn.
„ RESPLENDELLA. Dougl. Lynn.
ARGYRESTHIA EPHIPPELLA. Fab. Denton.
„ CURVELLA. Linn. Common at Lynn.
ORNIX GUTTEA. Haw. Gayton.
COLEOPHORA GRAMINICOLELLA. Hein. Near Lynn.
„ ALBITARSELLA. Zell. Denton.
„ NIGRICELLA. Steph. Lynn.
„ GRYPHIPENNELLA. Bou. Denton.
LAVERNA OCHRACEELLA. Curt. Denton, Castle Rising.
„ DECORELLA. Steph. Denton.
„ SUBBISTRIGELLA. Haw. Denton.
„ VINOLENTELLA. H.-S. Lynn.
ELACHISTA APICIPUNCTELLA. Stn. Denton.
„ SUBNIGRELLA. Dougl. Denton.
„ RHYNCHOSPORELLA. Stn. Lynn.
„ PALUDUM. Frey. Lynn
OPOSTEGA SALACIELLA. Tr. Roydon, abundant.
BUCCULATRIX MARITIMA. Stn. Lynn; probably in all salt marshes.
„ BOYERELLA. Dup. Lynn.
NEPTICULA MARGINECOLELLA. Stn. Denton.
ÆDEMATOPHORUS LITHODACTYLUS. Tr. Near Lynn.
LEIOPTILUS LIENIGIANNS. Zell. Also found near Lynn by Mr. Atmore.

XX.

HEMIPTERA.

By James Edwards, F.E.S.

Read 26th March, 1889.

By the additions here made to the list of Norfolk Hemiptera, the number of species known to occur in this county is brought up to five hundred and five, after allowing for the two errors in the list of 1884 (*ante* p. 700) noticed below, and one species since sunk as a synonym. This number is about equal to sixty-nine per cent. of the entire British list—a highly satisfactory proportion, and one which is scarcely likely to be exceeded by any area of similar extent. Our marshes, both on the coast and inland, but more particularly the former, produce many interesting and little-known species of Cicadina. The business of naming the Cicadina has, it is hoped, been in some measure facilitated by my "Synopsis of our British Species," published in the 'Transactions of the Entomological Society of London.' To the four species noted at p. 701 *ante* as apparently confined, so far as Britain is concerned, solely to this county, I have to add nine others; viz.—

Stalia boops. Schiödte. This species, which might be passed over as a brachypterous form of *Nabis flavomarginatus*, occurs sparingly on Mousehold Heath.

Liburnia reyi. Fieb. This fine species I found in August, 1887, by searching amongst Rushes in a coast-marsh at Weybourne; its continental distribution is given as "France, Germany, and Italy."

Idiocerus viduatus. Edw. My brother took a single female example of this species off Sallow in Foxley Wood, on the 10th September, 1885. It is allied to, but, according to description quite distinct from *Id. fasciatus*, Fieb.

Deltocephalus costalis. Fall. I beat two females of this beautiful species out of long Grass and Rushes in a very wet marshy place at Ranworth, on the 30th September, 1886.

Deltocephalus coroniceps. Kbm. I found one male of this very distinct, but little-known, species amongst a batch of *Athysanus melanopsis*, which I took off fine Grass growing under *Pteris* on Coxford Heath, on the 10th August, 1887. It was mistaken at the time for an immature female of the *Athysanus*; and as the latter were very difficult to catch, I contented myself with taking a very moderate series of them, and thus materially lessened my chance of securing more of the *Deltocephalus*.

Dicraneura similis. Edw. This species occurs on Grasses, and is rather widely distributed.

Cicadula cyanæ. Boh. I found a few specimens of this species in a coast-marsh at Weybourne, in October, 1888.

Cicadula fasciifrons. Stal. I had long had a specimen of this species standing in my collection as a variety of *Cicadula sexnotata*, before I found it in quantity at Cley, in August, 1888, and was thus enabled to recognise the species.

Cicadula fieberi. Edw. This species is identical with that of which Fieber's description, under the name *frontalis*, was published in the year 1885; but as Scott had already in 1875 described a totally different species under the same name, it becomes necessary to rename Fieber's species.

The following is a list of the one hundred and one species which have been added to our list during the last five years. I have in many instances given details of the circumstances under which a species has occurred, because I believe that our notions of the rarity or otherwise, of a species, frequently remain highly erroneous, simply because in the record of its occurrence the circumstances of its capture are not stated.

Æliodes inflexus. Wolff. Howe Grove. One example.

Rhacognathus punctatus. Linn. Mousehold Heath. Rare.

Zicrona cærulea. Linn. In a marsh adjoining the river Tat; one specimen, 10th August, 1887.

Pseudophlœus falleni. Schill. Brandon: J. J. Walker.

Corizus parumpunctatus. Schill. Drayton Drewray; one example by sweeping, 5th September, 1884.

METACANTHUS PUNCTIPES. Germ. Yarmouth, under *Ononis*; Mr. Thouless.

BERYTUS PYGMÆUS. Reut. } Household Heath.
„ MINOR. H.-S. }

NEIDES PARALLELLUS. Fieb. Hunstanton; one specimen found by searching on the sandhills, 31st July, 1885.

ISCHNOCORIS HEMIPTERUS. Sahl. At roots of Heath, Stratton Strawless, Household Heath.

RHYPAROCHROMUS SABULICOLA. Thoms. Yarmouth.

PERITRECHUS NUBILUS, Fall. Foxley Wood; one example.

„ PUNCTICEPS. Thoms. At roots of Grass, Household Heath. Yarmouth.

STYGNOCORIS RUSTICUS. Fall. Stoke Holy Cross, Sept. 1884; one developed example. Mr. Thouless.

DICTYONOTA CRASSICORNIS. Fall. Household Heath. Cley.

TERATOCORIS ANTENNATUS. Boh. On Rushes, Hunstanton, Weybourne, Ranworth.

„ SAUNDERSI. D. and S. With the last; also at Brundall and Surlingham.

PHYTOCORIS DIMIDIATUS. Reut. Not common.

„ REUTERI. Saund. Not uncommon.

CALOCORIS FULVOMACULATUS. De Geer. Foxley Wood. Rare; by sweeping.

„ TICINENSIS. Meyer. Honing; one pair, 23rd August, 1888. I think they came off Alder.

BOTHYNOTUS PILOSUS. Boh. Booton Common, 8th July, 1886, one developed male by sweeping. This, I believe, is the eighth recorded British example. The other records are four taken in July, 1865, by Dr. Sharp, on the hills between Loch Long and Loch Lomond; a fully-developed female near St. Leonards in 1878; and two undeveloped females in a sand-pit on the outskirts of a wood at Guestling, in Sept. 1880.

GLOBICEPS DISPAR. Boh. Earlham, Coxford, Hellesdon, at roots of plants.

HADRODEMA PINASTRI. Fall. Sprowston; on Scotch Fir.

CHLAMYDATUS PYGMÆUS. Zett. At roots of Rushes, etc., Coxford; Hellesdon.

Chlamydatus flaveolus. Reut. With the last; also at Ranworth.

Eroticoris rufescens. Burm. Under Heath and Ling, Stratton Strawless; St. Faith's; Drayton Drewray.

Pilophorus clavatus. L. Lakenham, Thetford.

Orthocephalus coriaceus. Fab. Bixley, by sweeping: Mr. Thouless.

Orthotylus flavosparsus. Sohl. On *Chenopodium* in coast-marshes, Hunstanton; Brancaster.

Conostethus roseus. Fall. Mousehold Heath by sweeping; rare.

Psallus salicellus. Meyer. Foxley Wood: on Hazel.

„ diminutus. Kbm. Common on Oaks.

Acanthia columbaria. Jen. Norwich, 1888.

„ hirundinis. Jen. Stoke Holy Cross.

Nabis poweri. Saunders. Horning, Surlingham, Cley, etc.

Stalia boops. Schiödte. Mousehold Heath.

Salda morio. Zett. Brumstead Common: one male, 21st July, 1887.

„ pilosella. Thoms. Salthouse, Cley; common.

„ marginella. Fieb. (Dougl.) Salthouse.

Corixa lugubris. Fieb. Cley.

„ semistriata. Fieb. Honing: August, 1888.

Sigara minutissima. Linn. In a ditch near the river Bure at Horning, 15th June, 1886.

„ scholtzi. Fieb. In the river Yare at Brundall, June, 1886.

Cixius similis. Kbm. Drayton Drewray.

Liburnia vittipennis. Sahl. On Grasses, common and widely distributed.

„ pallidula. Boh. On fine Grass, St. Faith's; Stratton Strawless.

„ punctulum. Kbm. Very abundant on long Grass on our wet commons.

„ scotti. Fieb. Common at the roots of Reeds.

„ smaragdula. Stäl. On Reeds, Ranworth.

„ unicolor. H.-S. On Reeds; Dersingham, Cley.

„ boldi. Scott. On marram Grass at Yarmouth.

„ signoreti. Scott. At roots of Grass by ditch sides; Brundall, Surlingham.

„ reyi. Fieb. Weybourne; at roots of Rushes.

„ lepida. Boh. With the last; also at Ranworth and Surlingham.

Liburnia difficilis. Edw. By sweeping partially submerged Grass by the edges of ponds, etc.

,, discreta. Edw. By sweeping in damp places.

,, denticauda. Boh. Woods in spring.

,, exigua. Boh. By sweeping Grass; Cley, Ringstead Downs.

,, venosa. Germ. At roots of coarse Grass, Dunston and Booton Commons.

,, brevipennis. Boh. With the last species.

,, straminea. Stal. Mousehold Heath, Stratton Strawless on fine Grasses.

,, lineata. Perris. At roots of fine Grass, Weybourne; one example, 8th August, 1887.

Stiroma bicarinata. H.-S. Scarce; Booton Common, by sweeping.

,, nigrolineata. Scott. Locally abundant in a salt marsh at Morston, on fine long Grass.

Strongylocephalus megerlei. Scott. Not common; at roots of plants in marshes at Horning, Ranworth, and Surlingham.

Acocephalus bifasciatus. Linn. Cossey Common; one specimen, 4th August, 1887.

,, brunneo-bifasciatus. Geoff. Widely distributed, but not common. Caistor, Swanton Morley, Weybourne.

,, histrionicus. Fab. At roots of plants in dry places; not common.

Allygus commutatus. Fieb. A single female beaten out of an Elm fence at Lakenham, 1st September, 1887.

Paramesus nervosus. Fall. Common on Sedges in coast marshes.

Glyptocephalus proceps. Kbm. Amongst Grasses, widely distributed, but not common.

Pediopsis ulmi. Scott. On Elm at Eaton. I fear that the locality for this species is now destroyed.

Idiocerus viduatus. Edw. Foxley Wood; on Sallow. Rare.

Thamnotettix variegata. Kbm. Widely distributed, but not common.

,, plebeja. Fall. Amongst long Grass in a badly-kept garden at Norwich, in July and August, 1887

THAMNOTETTIX ATTENUATA. Germ. Amongst fine Grass growing under *Pteris* on Mousehold Heath.

ATHYSANUS SAHLBERGI. Reut. By sweeping in damp places; widely distributed but hardly common.

„ MELANOPSIS. Hardy. On fine Grass growing under *Pteris* on Coxford Heath.

DELTOCEPHALUS REPLETUS. Fieb. Stratton Strawless, and Brumstead, Whitwell, and Dunston Commons. By sweeping; scarce.

„ PICTURATUS. Fieb. Rare. Dunston Common, Ringland.

„ ARGUS. Marsh. Mousehold Heath; on fine Grass under *Pteris*.

„ COSTALIS. Fall. Ranworth; rare.

„ PALEACEUS. J. Sahl. Brooke, by sweeping.

„ CORONICEPS. Kbm. Coxford Heath; rare.

„ MACULICEPS. Boh. On the bare parts of Heathy Common at St. Faith's. Very local.

CICADULA METRIA. Flor. Amongst herbage on ditch and river sides; widely distributed.

„ CYANÆ. Boh. A few specimens taken by sweeping in a coast-marsh at Weybourne, 18th October, 1888.

„ FASCIFRONS. Stal. Drayton Drewray, Cley, Brooke.

„ FIEBERI. Edw. (= FRONTALIS. Fieb.) Weybourne, Cley, Brooke.

DICRANONEURA SIMILIS. Edw. Stratton Strawless, St. Faith's.

„ MOLLICULA. Boh. Common about *Labiates*, both in wet and dry situations.

EUPTERYX COLLINUS. Flor. Locally abundant on *Ballota nigra*.

„ TENELLUS. Fall. In a lane off Unthank's Road, also at Earlham, on *Achillea millefolium*. Very local.

„ MELISSÆ. Curt. } On Mint in my garden, and
„ AURATUS. Linn. } doubtless elsewhere.

„ CONCINNA. Germ. On Oaks with *E. pulchellus*, and probably equally common.

TYPHLOCYBA SALICICOLA. Edw. On Sallows; widely distributed and common.

PSYLLA HIPPOPHAES. Forst. On *Hippophae rhamnoides* at Winterton, 25th August, 1887.

Aphalara artemisiæ. Forst. On *Artemisia maritima*. Local.

„ nervosa. Forst. On *Achillæa millefolium*; widely distributed.

I append the following notes of habitats, corrections, etc., in the hope that they may prove useful to future workers at this group of insects.

Corimelæna scarabæoides. Linn. This species continues scarce. My examples were found under dead leaves at Eaton in the spring of 1874, and Mr. Thouless took one at Howe Grove in July, 1888.

Podops inunctus. Fab. My original example, taken under a stone in a chalk pit at Cringleford, and another found by Mr. Thouless on Mousehold Heath, are the only Norfolk specimens which have come under my notice.

Sehirus picipes. Fall. I have taken this in a lane off the Unthanks Road.

Podisus luridus. Fab. Occasionally common on Birch.

Pentatoma verbasci. De Geer. Mr. Thouless took an example off Birch at Drayton Drewray in October, 1887.

Bathysolen nubilus. Fall. I found a dead specimen of this species at roots of Grass in a lane off Unthanks Road.

Alydus calcaratus. Linn. Has occurred abundantly on the ground amongst Furze bushes at Dunston Common.

Plociomerus fracticollis. Schill. Was common by sweeping herbage by ditch-sides at Horning in 1888.

Rhyparochromus prætextatus. H.-Sch. I took one specimen of this species at roots of Grass on a dry bank at Earlham, on the 20th June, 1887.

Heterogaster urticæ. Fab. Mr. Thouless has found this species at Lowestoft.

Serenthia læta. Fall. This species sometimes swarms in our coast-marshes.

Berytus crassipes. H.-Sch.
Macrocoleus hortulanus. Meyer. } Lowestoft: Mr. Thouless.

Acalypta cervina. Germ. Continues rare.

Miris holsatus. Fab. Has occurred in several localities.

Pantilius tunicatus. Fab. Used to be common on Birch, but I have seen scarcely any specimens since 1883.

Lopus gothicus. Linn. The Raspberry plants on Dunston Common, on which this species used to occur, have been stubbed up, and it is to be feared that the *Lopus* is lost there.

Miridius quadrivirgatus. Costa. Lowestoft: E. Saunders.

Dichrooscytus rufipennis. Fall. The Scotch Fir-tree on which this species occurred stood on the Heigham Lodge estate, and is now either inaccessible or destroyed.

Chlamydatus amblans Fall. Occurs in woods or similar places.

„ caricis. Fall. Is very abundant at the roots of Rushes, etc., in coast-marshes.

Systellonotus triguttatus. Linn. Is probably generally distributed in dry heath-like places.

Stiphrosoma leucocephala. Linn. I have only met with one example since 1883.

Heterocordylus unicolor. Hahn. I only know this species from *Genista tinctoria* on Wacton Common.

Orthocephalus saltator. Hahn. May be found running on the ground in gravelly places on Mousehold Heath.

Plagiognathus pulicarius. Fall., and Saltitans. Fall. Are probably of general occurrence amongst stunted vegetation in dry places.

Acompocoris alpinus. Reut. The Norfolk record of this insect rests on a single example taken by the late Mr. Dossetor in a Fir plantation near Mousehold Heath, and sent by him to Mr. Edward Saunders.

Ploiaria culiciformis. De Geer. The original Norfolk examples of this species were taken in Messrs. Barnard, Bishop, and Barnard's counting-house; and I have since taken a few in a comparatively newly-built out-house in my garden.

Coranus subapterus. De Geer. Proves to be not uncommon on the ground in dry heath-like places.

Salda cocksi. Curt. My specimens were taken in August, 1875, out of tufts of Grass by ditch-sides, in the Heigham Osier Carr, now the site of the Eastern and Midlands Railway Station.

SALDA CINCTA. H.-Scff. Is common in marshy places.

„ LITTORALIS. Linn. Has occurred at Postwick and Lakenham.

GERRIS RUFOSCUTELLATA. Latr. Has occurred at Drayton Drewray and Horning.

MICROVELIA PYGMÆA. Duf. Mr. Thouless found a specimen with developed elytra on Hickling Broad, on 14th April, 1884.

GARGARA GENISTÆ. Fab. Has been taken by Mr. Frank Norgate at Santon Downham, when beating Broom for larvæ of *Chesias obliquaria*.

ISSUS COLEOPTRATUS. Fab. I obtained the nymph and subsequently the imago of this species, by beating Ivy growing on the palings of Cossey Park. It has also occurred in a lane off the Earlham Road.

ASIRACA CLAVICORNIS. Fab. The habitat of this species seems to be at the roots of plants in dry places. Mr. Thouless has taken it in quantity on a dry bank at Lakenham.

LIBURNIA FORCIPATA. Boh., and DISCOLOR. Boh. Are common in woods in the spring.

„ EXTRUSA. Scott. (p. 713.) = FAIRMAIREI. Perris.

„ COGNATA. Fieb. (*l.c.*) = AUBEI. Perris.

STIROMA NASALIS. Boh. (p. 714) = AFFINIS. Fieb.

STRONGYLOCEPHALUS AGRESTIS. Fall. Is widely distributed in marshy places.

ACOCEPHALUS RIVULARIS. Don. (p. 714) = FLAVOSTRIATUS. Don.

PEDIOPSIS NASSATUS. Germ. The record of this species (p. 715 *ante*) is an error.

IDIOCERUS TREMULÆ. Estl. This species has occurred on Aspen at Howe.

DORATURA STYLATA. Boh. On the sandhills at Hunstanton in July, 1885, I took several examples of a large pale race of this species. In actual measurement these are about one-half larger than the ordinary form, but the difference in size is apparently much greater. The ordinary form occurred in a marsh just behind the sandhills; but the two races were not intermingled. I have not detected any structural differences between the two.

LIMOTETTIX STRIOLA. Fall. Is widely distributed. I have found it at St. Faith's, Brumstead Common, Hickling, etc.

„ FRONTALIS. Schäff. [p. 716) = ANTENNATA. Boh.

ATHYSANUS PICEUS. Scott. This is only a melanic variety of *Ath. obsoletus*, Kbm.

„ PLEBEJUS. Fall. The insect recorded under this name (*l.c.*) = A. COMMUNIS, J. Sahl.

DELTOCEPHALUS ASSIMILIS. Fall. (*l.c.*) = D. CITRINELLUS. Kbm.

„ PROPINQUUS. Fieb. (*l.c.*) Is an error.

EUPTERYX ABROTANI. Douglas. Has been found on *Artemisia maritima* at Morston and Cley.

ZYGINA SCUTELLARIS. Schäff. Is widely distributed amongst fine Grass in dry places.

XXI.

FLOWERING PLANTS AND FERNS.*

By Herbert D. Geldart.

Read 26th March, 1889.

This somewhat bulky list of additions to the Flora of Norfolk has been very much enlarged by an attempt to show the effect of the late Rev. Kirby Trimmer's 'Supplement to the Flora of Norfolk,' on the record of distribution of species throughout the four divisions of the County adopted by the Society, and in the genus *Mentha* the list now given entirely supersedes the list kindly

* The lists to which the present list is supplemental are, "Flowering Plants and Ferns," Section I. and II. (Trans. Norfolk and Norwich Nat. Soc. vol. ii. pp. 74–110, and pp. 229–242). "Norfolk Naiadeæ and Characeæ" (vol. iii. pp. 379–383), and "Additions and Corrections" (vol. iii. pp. 719–729).

drawn up by Mr. Trimmer, which will be found in the second volume of the Society's 'Transactions' (pp. 99–102). The Rev. F. W. Galpin's excellent 'Flora of Harleston' has yielded a large number of additional localities in Norfolk. This book is reviewed in the present volume (pp. 578-582). The entries taken from Mr. Trimmer's work are marked with the letters "K. T. S.," and those from the 'Flora of Harleston' with Mr. Galpin's initials, "F.W.G."

The lists of *Rubi* and *Rosæ*, and the general distribution throughout the County (especially in the 'sc.' division), have been very much enriched by notes furnished by the Rev. E. F. Linton, whom I have to thank for most kindly reading over and correcting the entire list before publication. Mr. Linton has also examined the older portion of the herbarium of the late J. D. Salmon in the Norfolk and Norwich Museum. Localities taken from this source are marked "Hb. Sal.," and Mr. Linton's own contributions bear his initials, "E.F.L."

The following species, which are usually considered indigenous in Great Britain, are new to the County:—*Sisymbrium irio*, *Silene nutans*, *Sagina ciliata*, *Epilobium roseum*, *Crepis taraxacifolia*, *Primula elatior* (Jacq.), *Sparganium neglectum*, *Goodyera repens*, *Psamma baltica*, and *Asplenium viride*. There are also many new species, such as *Anemone apennina*, *Eranthis hyemalis*, and others included in brackets, which are almost certainly not wild. There are also a large number of new sub-species, varieties, and forms, amongst which may be specially noticed, *Sonchus arvensis* var. *angustifolius*, new to the British Flora, discovered at Wells by Mr. Long, and the curious "hybrid" or "intermediate" Rushes, *Juncus diffusus*, found by Mr. Linton, and *J. compressus* x *Gerardi* and *J. lamprocarpus* x *acutiflorus*, found by Mr. Long: all these are noticed in their respective places in the list.

A new, and, it is believed, more correct, arrangement of genus *Statice* has been adopted. *S. bahusiensis* has been erased, as the very slight variety of *S. limonium* which has passed under that name on our coast does not agree with correct specimens of *S. rariflora*, Drejer, from the south coast of England, as according to Syme (E.B., third edition) it ought to do.

SECTION I.

DICOTYLEDONOUS PLANTS.

Ranunculaceæ.

[Anemone apennina. Linn.] F.W.G. . . e. — — —
Adonis autumnalis. Linn. F.W.G. . . e. — — —
Ranunculus fluitans. Linn. F.W.G. and K.T.S. e. — — w.
„ peltatus. Fries.
b, floribundus . . . — — sc. —
Dickleburgh, H.D.G.
„ confusus. Godr. . . . . — nc. — w.
Titchwell and Wells. K.T.S.
„ drouetii. Schultz. . . . . e. — sc. —
F.W.G.; Dickleburgh, H.D.G.
„ arvensis. Linn. F.W.G. . . — — sc. —
[Eranthis hyemalis. Salis.] F.W.G. . . e. — — —

Nymphæaceæ.

Nymphæa alba. Linn. F.W.G. and E.F.L. . — — sc. —

Papaveraceæ.

Papaver rhœas. Linn.
var. strigosum. E.F.L. . . e. — — —

Fumariaceæ.

[Corydalis solida. Hooker.] F.W.G. . . e. — — —
„ claviculata. D.C. K.T.S. . . — — sc. —

Cruciferæ.

Diplotaxis muralis. D.C. . . . . — nc. — —
Probably var. Babingtonii
Wells, E.F.L. and F. Long.
Sisymbrium irio. Linn. . . . . e. — — —
Thorpe Hamlet, K.T.S.
Hesperis matronalis. Linn. F.W.G. . . e. — — —
Arabis perfoliata. Lam. F.W.G. . . — — sc. —
Barbarea præcox. Brown. . . e. — — —
Thorpe, E.F.L.
Nasturtium palustre. D.C. F.W.G. and E.F.L. — nc. sc. —

Camelina sativa. Crantz. K.T.S. . . . — — — w
Lepidium campestre. Brown. F.W.G. . . — — sc. —
„ draba. Linn. . . . . — nc. — —
Brancaster, F. Long.

Violaceæ.

Viola palustris. Linn. F.W.G. . . . — — sc. —
„ hirta. Linn. K.T.S. . . . — nc. — —
„ reichenbachiana. Bor. E.F.L. . e. — sc. —

Caryophyllaceæ.

Silene inflata. Sm. E.F.L. . . . — — sc. —
„ „ var. puberula. F.W.G. . . e. — — —
„ nutans. Linn. F.W.G. . . . e. — — —
Stellaria aquatica. Scop. F.W.G. . . e. — — —
„ glauca. With. F.W.G. and E.F.L. . — — sc. —
Sagina ciliata. Fries. . . . . — — — —
"e" and "w." Top. Bot.
Spergularia neglecta. Syme. E.F.L. . . — nc. — —
„ marginata. Syme. E.F.L. . . — nc. — —

Illecebraceæ.

Scleranthus biennis. Reuter. E.F.L. . . — nc. — w.

Hypericaceæ.

Hypericum hirsutum. Linn. K.T.S. . . — — — w.

Malvaceæ.

Malva moschata. Linn. F.W.G. . . . — — sc. —

Geraniaceæ.

[Geranium striatum. Linn.] F.W.G. . . e. — — —
„ phæum. Linn.] F.W.G. . . e. — sc. —
„ pratense. Linn. F.W.G. . . e. — — —
„ pyrenaicum. Linn. F.W.G. . . e. nc. — —
Holkham, F. Long; Dereham, E.F.L.
„ pusillum. Linn. F.W.G. . . — — sc. —
„ robertianum, fl. alb. F.W.G. . . — — sc. —
[Oxalis corniculata. Linn.] F.W.G. . . e. — — —

LEGUMINIFERÆ.

ULEX GALLII. Planch. E.F.L.		—	—	—
GENISTA ANGLICA. Linn. F.W.G.			sc.	
ONONIS SPINOSA. Linn. F.W.G., and Field Dalling, F. Long.	e.	nc.	—	—
„ SPINOSA, fl. alb. F.W.G.		—	sc.	—
„ REPENS. Linn. F. Long.		nc.	—	—
ANTHYLLIS VULNERARIA. Linn. Hb. Sal.		—	sc.	—
MELILOTUS OFFICINALIS. Willd. K.T.S.		nc.	—	—
TRIFOLIUM SUBTERRANEUM. Linn. K.T.S.		—	sc.	—
„ PRATENSE. var. parviflorum. F. Long.		nc.	—	—
„ HYBRIDUM. Linn. F.W.G. and H.D.G.	e.	nc.	—	—
„ INCARNATUM. Linn. F.W.G.	e.	—	sc.	—
„ ARVENSE. Linn. F.W.G. and E.F.L.		—	sc.	—
ASTRAGALUS HYPOGLOTTIS. Linn. K.T.S.		—	sc.	—
HIPPOCREPIS COMOSA. Linn. K.T.S.		nc.	—	—
ONOBRYCHIS SATIVA. Lam. Hb. Sal.		—	sc.	—
VICIA SEPIUM. Linn. fl. alb. F.W.G.	e.	—	—	—
„ ANGUSTIFOLIA. b, Bobartii. Forst. E.F.L.		—	sc.	—
LATHYRUS NISSOLIA. Linn. F.W.G.	e.	—	—	—

ROSACEÆ.

SPIRÆA FILIPENDULA. Linn. K.T.S.	e.	—	—	—
SANGUISORBA OFFICINALIS. Linn. K.T.S.	e.	—	—	—
POTERIUM SANGUISORBA. Linn. Croxton, H.D.G.		—	sc.	—
„ MURICATUM. Spach. F.W.G.	e.	—	—	—
ALCHEMILLA VULGARIS. Scop. K.T.S.	e.	nc.	—	—
RUBUS PLICATUS. W. and N. Beeston St. Andrew, and Gressenhall, E.F.L.	e.	nc.	—	—
„ AFFINIS. W. and N. Mousehold and Ormesby, E.F.L.	e.	—	—	—
„ LINDLEIANUS. Lees. F.W.G. and E.F.L. Beetley, E.F.L.	e.	nc.	—	—
„ INCURVATUS. Bab. E.F.L. and F.W.G.	e.	—	sc.	—

RUBUS RUSTICANUS. Merc. (= ulmifolius, Sch.)
var. dissectus, Mennell. . . e. — — —
,, LEUCOSTACHYS. Smith. F.W.G. and E.F.L.; Beetley, E.F.L. e. nc. — —
,, ,, var. conspicuus, P. J. Müll. = vestitus, W. and K. Mr. Mennell. e. — — —
,, PYRAMIDALIS. Kalt. [Hirtifolius, Müll.] E.F.L. and Mennell . . e. — — —
,, SALTERI. Bab. F.W.G. . . . e. — — —
,, ,, b, calvatus, Blox. E.F.L. . e. — — —
,, VILLICAULIS. Kœhl. E.F.L. . . e. — — —
,, GRATUS. Focke. E.F.L. . . . e. — — —
,, MUENTERI. Mars. E.F.L. . . . e. nc. — — N. Elmham, E.F.L.
,, MACROPHYLLUS. Weihe. . . . e. nc. — — Newton St. Faith's, E.F.L.
,, ,, var. Schlechtendahlii, W. and N. . . . . e. nc. — — Beeston, Ormesby and Cawston, E.F.L.
,, ,, var. amplificatus, Lees. E.F.L. . . . . e. — — —
,, GELERTII. Friderichsen. E.F.L. . e. — — —
,, NEWBOULDII. Bab. . . . . e. nc. — — N. Elmham, E.F.L.
,, BABINGTONII. Salt. F.W.G. . . e. — — —
,, ECHINATUS. Lindl. E.F.L. . . e. — — —
,, RADULA. Weihe. . . . . e. nc. — — Cawston, E.F.L.
,, PALLIDUS. W. and N. [non. Bab.] E.F.L. e. — — —
,, LINTONI. Focke. E.F.L. . . . e. — — —
,, TERETICAULIS. P. J. Müll. E.F.L. . e. — — —
,, HIRTUS. P. J. Müll. [rotundifolius, Blox.] Sprowston, E.F.L. e. — — —
,, CORYLIFOLIUS. Linn.
,, ,, a. sublustris. Lees. . e. nc. — w. N. Elmham, Swaffham, E.F.L

RUBUS CORYLIFOLIUS. var. fasciculatus. Bab. F.W.G. and E.F.L. . . . e. — — —

„ SCABROSUS. P. J. Müll. E.F.L. . . e. — —

„ CÆSIUS. Linn.

var. tenuis. F.W.G. and E.F.L. e. — — —

„ „ ligerinus. Genev . . — — sc. — Larlingford, E.F.L.

„ „ intermedius. Bab. . . — nc. — — Gressenhall, E.F.L.

„ „ hispidus. F.W.G. . . e. — — —

ROSA RUBIGINOSA. Linn. E.F.L. . . . — nc. — —

„ „ var. comosa. Ripart . e. — — — Sprowston and Haynford, E.F.L.

„ ECHINOCARPA. Ripart. E.F.L. . . e. — — —

„ TOMENTOSA.

var. scabriuscula. E.F.L. . . e. — — —

„ CANINA. Linn.

„ „ var. lutetiana. Leman. . — nc. sc. — N. Elmham, Flordon, E. Harling. E.F.L.

„ „ var. surculosa. Woods. Frettenham and Loddon, E.F.L. e. — — —

„ „ var. sphærica. Gren. . — nc. — w. N. Elmham and Castle Acre, E.F.L.

„ „ var. senticosa. Ach. E.F.L. e.

„ „ var. dumalis. Bechst. . — nc. sc. w. Beetley, Larling, and Swaffham, E.F.L.

„ „ var. urbica. Leman. . e. nc. sc. w. Larling, E.F.L.; Denver, Hb. Sal.

„ „ var. arvatica. Baker. . — nc. sc. w. Gressenhall, Flordon and Swaffham E.F.L.

„ „ var. dumetorum. Thuill. e. — — w. Castle Acre, E.F.L.

„ „ var. obtusifolia. Desv. . e. nc. sc. w. Sprowston, Horsford, Larlingford, Swaffham, E.F.L.

ROSA CANINA. var. tomentella. Lein. . . e. nc. sc. —
Loddon, E.F.L.
" " var. verticillacantha. Merat. — nc. — —
Lexham, E.F.L.
" " var. Borreri. Woods. E.F.L. e. — — —
" " var. marginata. [Auct.] e. — — —
E.F.L.
" ARVENSIS. var. bibracteata. F.W.G. e. — — —
PYRUS ARIA. Hooker. K.T.L. . . . — — — w.
" MALUS. Linn. F.W.G. . . . — — sc. —
" " mitis. E.F.L. . . e. — sc. —
" " acerba. E.F.L. . . e. — sc. —

ONAGRACEÆ.

EPILOBIUM PALUSTRE. Linn. F.W.G. . . — — sc. —
" ROSEUM. Schreb. E.F.L. . . . — nc. — —

HALORAGIACEÆ.

MYRIOPHYLLUM PEDICILLATUM.
b, pectinatum. D.C. Mennell. e. — — —
CALLITRICHE HAMULATA. Kutz. F.W.G. . — — sc. —

CRASSULACEÆ.

SEDUM ALBUM. Linn. Hb. Sal. . . . — — — w.
" RUPESTRE. Huds. K.T.S. and F.W.G. — nc. sc. —

SAXIFRAGACEÆ.

CHRYSOSPLENIUM ALTERNIFOLIUM. Linn. F.W.G. e. — — —

UMBELLIFERÆ.

CICUTA VIROSA. Linn. K.T.S. . . . — — sc. —
HELOSCIADIUM INUNDATUM. Koch. F.W.G. . — — sc. —
ÆGOPODIUM PODAGRARIA. Linn. E.F.L. . . — nc. — —
SIUM ANGUSTIFOLIUM. Linn. E.F.L. . . — — sc. —
BUPLEURUM ROTUNDIFOLIUM. Linn. F.W.G. . e. — — —
ÆNANTHE PIMPINELLOIDES. Linn. K.T.S. . — — sc. —
" CROCATA. Linn. K.T.S. . . — nc. — —
" FLUVIATILIS. Colem. E.F.L. and F.W.G. e. — sc. —
FÆNICULUM VULGARE. Gaert. K.T.S. . . — — sc. —

PEUCEDANUM PALUSTRE. Mænch. K.T.S. . . — — sc. —
HERACLEUM SPHONDYLIUM.
var. angustifolium. Mennell. . e. — — —
TORILIS ANTHRISCUS. Gaert. F.W.G. and E.F.L.. — — sc. —
CHÆROPHYLLUM TEMULUM. Linn. E.F.L. . . — — — w.

RUBIACEÆ.

GALIUM ANGLICUM. Huds. F.W.G. . . . e. — — —
„ TRICORNE. With. K.T.S. . . . — nc. — —
ASPERULA CYNANCHICA. Linn. E.F.L. . . — — sc. —
SHERARDIA ARVENSIS. Linn. E.F.L. . . — — sc. —

VALERIANACEÆ.

VALERIANELLA OLITORIA. Mænch. Hb. Sal. . — — sc. —

DIPSACEÆ.

SCABIOSA SUCCISA. Linn. F.W.G. and E.F.L. . — — sc. —
„ COLUMBARIA. Linn. F.W.G. . . — — sc. —

COMPOSITÆ.

SILYBUM MARIANUM. Gaert. F.W.G. . . — — sc. —
CARLINA VULGARIS. Linn. Hb. Sal. . . — — sc. —
CENTAUREA SOLSTITIALIS. Linn. Hb. Sal. . . — — sc. —
CHRYSANTHEMUM LEUCANTHEMUM. Linn. E.F.L. — — sc. —
ACHILLEA PTARMICA. Linn. F.W.G. . . — — sc. —
ARTEMISIA ABSINTHIUM. Linn. Hb. Sal. . . — — sc. —
„ MARITIMA.
b, gallica [Willd.]. E.F.L. . — nc. — —
FILAGO SPATHULATA. Presl.
E.F.L. and Rev. W. R. Linton. . e. nc. — —
GNAPHALIUM SYLVATICUM. Linn. F.W.G. . . — — sc. —
SENECIO VISCOSUS. Linn. K.T.S . . . — — sc. —
„ SQUALIDUS. Linn. E.F.L. . . e. — — —
BIDENS CERNUA. Linn. F.W.G. and Hb. Sal. . — — sc. —
„ „ radiata. E.F.L. . . . e. — — —
INULA CONYZA. D.C. K.T.S. . . . — — sc. —
„ PULICARIA. Linn. K.T.S. . . — — sc. w.
ERIGERON ACRIS. Linn. H.D.G. . . . — nc. — —

[Petasites fragrans. Presl.] F.W.G. . . e. — sc. —
Lapsana communis. Linn. E.F.L. . . . — — sc. —
Arnoseris pusilla. Gaert. K.T.S. . . . — — sc. —
Hypochæris glabra. Linn. E.F.L. . . — — sc. —
„ radicata. Linn. E.F.L. . . — — sc. —
Leontodon hirtus. Linn. F.W.G. . . — — sc. —
„ autumnalis. Linn. E.F.L. . . — — sc. —
Tragopogon pratensis.
var. grandiflorus. Bosw. E.F.L. e. — — —
Lactuca scariola. Linn. F.W.G. . . . e. — sc. —
Sonchus arvensis.
var. angustifolius. Mey. . . — nc. — —
Wells, F. Long.
Crepis virens. Linn. E.F.L. . . . . — — sc. —
„ taraxacifolia. Thuill. E.F.L. and
F. Long . . . . . e. nc. — —
Hieracium vulgatum. Fries. E.F.L. . e. — — —

Campanulaceæ.

Campanula patula. Linn. F.W.G. . . . e. — —

Ericaceæ.

Pyrola rotundifolia. Linn. K.T.S. . . — nc. — —
Monotropa hypopitys. Linn. K.T.S. . . — — — w.

Gentianaceæ.

Erythræa pulchella. Fries. . . . . — nc. — —
Wells, F. Long.
Chlora perfoliata. Linn. K.T.S. . . — — — w.

Convolvulaceæ.

Cuscuta epithymum. Murr. F.W.G. . . — — sc. —

Solanaceæ.

[Lycium barbarum. Linn.] F.W.G. and E.F.L. e. nc. sc. w.

Scrophulariaceæ.

Verbascum virgatum. With. K.T.S.			—	—	sc.	—
Linaria elatine. Mill. F.W.G. and E.F.L.			—	nc.	sc.	—
,, spuria. Mill. K.T.S.			—	—	—	w.
Limosella aquatica. Linn. K.T.S.			e.	—	—	—
Veronica buxbaumii. Ten. E.F.L.			—	—	sc.	—
,, scutellata.						
var. pubescens. K.T.S.			—	—	—	w.

Orobanchaceæ.

Orobanche elatior. Sutt. F.W.G.			e.	—	—	—

Labiatæ.

Mentha rotundifolia. Linn.				nc.	sc.	—
,, alopecuroides. Hull.			e.	nc.	sc.	—
,, sylvestris. Linn.						
var. a			e.	nc.	sc.	—
,, nemorosa. Bentham.			e.	nc.	sc.	w.
,, mollissima. Benth.			—	—	sc.	w.
,, undulata. "Willd."			—	—	sc.	—
,, viridis. Linn.			e.	nc.	—	w.
var. crispata.			—	—	sc.	—
,, piperita. Huds.						
var. officinalis. Sole.			e.	nc.	sc.	—
,, vulgaris. Sole.			e.	—	—	w.
,, pubescens. Willd.			—	nc.	—	—
var. hircina.			—	nc.	—	—
,, citrata. Ehrh.			—	nc.	—	—
,, hirsuta. Linn.						
form a			e.	nc.	sc.	w.
,, b			e.	nc.	sc.	—
,, c			e.	nc.	sc.	w.
,, d			e.	nc.	sc.	w.
,, e			e.	nc.	—	w.
,, f			e.	nc.	—	w.
var. subglabra. Baker.			e.	nc.	sc.	w.
,, sativa. Linn.			e.	nc.	sc.	w.
var. paludosa.			—	nc.	—	—
,, subglabra. Baker.			e.	nc.	sc.	w.

MENTHA RUBRA. Sm. . . . . e. nc. sc. —
,, GRACILIS. Sm. . . . . — nc. sc. —
var. cardiaca. . . . . e. — — —
,, GENTILIS. Linn. . . . . e. nc. sc. w.
var. Wirtgeniana. . . . e. nc. — w.
var. Pauliana. . . . . e. — sc. w.
,, ARVENSIS. Linn. . . . . e. nc. sc. w.
var. agrestis. . . . . e. nc. — w.
,, nummularia. . . . e. nc. sc. w.
,, præcox. . . . . e. nc. sc. w.
,, Allioni. . . . . — nc. sc. w.
,, PULEGIUM. Linn. . . . . — nc. sc. —
var. erecta. . . . . e. nc. — —
THYMUS CHAMÆDRYS. Fries. E.F.L. . . e. — — —
CALAMINTHA NEPETA. Clairv. . . . . — nc. — —
Stiffkey, F. Long.
SCUTELLARIA GALERICULATA. Linn. F.W.G. and
E.F.L. . . . . — — sc. —
,, MINOR. Linn. K.T.S. . . . e. — — —
GALEOPSIS TETRAHIT. Linn. E.F.L. . . . — — sc. —

BORAGINACEÆ.

MYOSOTIS COLLINA. var. Mitteni. . . . e. — — —
Thorpe, E.F.L.
SYMPHYTUM OFFICINALE. Linn. F.W.G. . . — — sc. —

PRIMULACEÆ.

PRIMULA ELATIOR. Jacq. Dickleburgh, F.W.G. — — sc. —
LYSIMACHIA NEMORUM. Linn. F.W.G. and E.F.L. — — sc. —
CENTUNCULUS MINIMUS. Linn. K.T.S. . . — — sc. —

PLUMBAGINACEÆ.

[STATICE BAHUSIENSIS to be erased and the genus
will then stand thus. H.D.G.]
STATICE LIMONIUM. Linn.
a, genuina. Syme. . . e. nc. — w.
b, pyramidalis. Syme. . . — nc. — w.

STATICE AURICULÆFOLIA. Vahl.
a, occidentalis. Lloyd. . . — nc. — w.
„ RETICULATA. Smith. . . . . — nc. — w.

PLANTAGINACEÆ.

LITTORELLA LACUSTRIS. Linn. K.T.S. . . — — sc. —

CHENOPODIACEÆ.

SALICORNIA HERBACEA.
b, procumbens. E.F.L. . . — nc. — —
CHENOPODIUM ALBUM.
var. viride. F.W.G. . . e. — — —
„ paganum. F.W.G. . . — — sc. —
„ FICIFOLIUM. Linn. K.T.S. . . — — — w.
ATRIPLEX DELTOIDEA. Bab. F.W.G. . . e. — — —
„ LITTORALIS.
var. marina. . . . . — nc. — —
Cley, F. J. Hanbury.
„ TRIANGULARIS. F.W.G. . . . e. — — —
„ PATULA.
var. erecta. F.W.G. . . . — — sc. —
„ HASTATA. var. Smithii. F.W.G. . e. — — —

POLYGONACEÆ.

RUMEX CONGLOMERATUS. Murr. E.F.L. . . — — sc. —
„ NEMOROSUS.
a, viridis. E.F.L. . . . — — sc. —
„ OBTUSIFOLIUS. Auct.
var. Friesii. E.F.L. . . — nc. — —

EUPHORBIACEÆ.

EUPHORBIA EXIGUA.
var. retusa. F.W.G. . . — — sc. —
„ LATHYRIS. Linn. F.W.G. . . e. — — —

CERATOPHYLLACEÆ.

CERATOPHYLLUM AQUATICUM.
b, submersum. F.W.G. and K.T.S. — — sc. w.

AMENTIFERÆ.

SALIX FRAGILIS. Linn. E.F.L. . . . — nc. — —
„ „ undulata. E.F.L. . . e. — — —
„ TRIANDRA. Linn. E.F.L. . . — nc. — —
„ PURPUREA. Linn. F.W.G. . . — — sc. —

SECTION II.

MONOCOTYLEDONOUS PLANTS.

TYPHACEÆ.

SPARGANIUM NEGLECTUM. Beeby. . . . e. — sc. —
F.W.G., and Flordon, Mr. H. G. Glasspoole.
„ MINIMUM. Fries. Hb. Sal. . . — — — w.

NAIADACEÆ.

POTAMOGETON PRÆLONGUS. Wulf.
Welney, Mr. Fryer. . . . — — — w.
„ PERFOLIATUS. Linn. . . . . — — sc. —
Thetford, Mr. Salmon.
„ PUSILLUS.
b, tenuissimus. E.F.L. . . e. nc. — —
ZANNICHELLIA PEDICILLATA. Fries. . . . e. — — —
Horsey, Mr. Mennell.
RUPPIA SPIRALIS. Hartm. K.T.S. . . e. nc. — —
„ ROSTELLATA. Koch. K.T.S. . . — — — w.

HYDROCHARIDACEÆ.

STRATIOTES ALOIDES. Linn. F.W.G., Hb. Sal., and K.T.S. . . . . — nc. sc. —

ORCHIDACEÆ.

ACERAS ANTHROPOPHORA. Br. F.W.G. . . e. — — —
SPIRANTHES AUTUMNALIS. Rich. K.T.S. . . — — sc. —
GOODYERA REPENS. Br. . . . . e. — — —
Westwick, Miss Southwell.
EPIPACTIS PURPURATA. Sur. F.W.G. . . e. — — —
„ LATIFOLIA. Auct. K.T.S. . . — nc. sc. —

IRIDACEÆ.

IRIS FŒTIDISSIMA. Linn. F.W.G. . . . — — sc. —
CROCUS VERNUS. All. F.W.G. . . . e. — — —

AMARYLLIDACEÆ.

[NARCISSUS BIFLORUS. Curt.] F.W.G. . . e. — — —
[„ MAJOR. Linn.] F.W.G. . . . e. — — —

LILIACEÆ.

FRITILLARIA MELEAGRIS. Linn. F.W.G. . . e. — — —
[LILIUM MARTAGON. Linn.] F.W.G. . . e. — — —
[ORNITHOGALUM PYRENAICUM. Linn.] F.W.G. . e. — — —
COLCHICUM AUTUMNALE. Linn. F.W.G. . . e. — — —

JUNCACEÆ.

LUZULA CAMPESTRIS. D.C. E.F.L. . . . — — sc. —
„ MULTIFLORA. Koch. F.W.G. . . — — sc. —
„ „ b, congesta. K.T.S. . — — sc. —
JUNCUS CONGLOMERATUS. Linn. E.F.L. . . — — sc. —
„ DIFFUSUS. Hoppe. E.F.L. . . . e. nc. — —
„ NIGRITELLUS. Auct. Ang. . . . — nc. — —
„ COMPRESSUS × GERARDI. Buchenau. . — nc. — —
Holkham, F. Long.
„ LAMPROCARPUS × ACUTIFLORUS. . . — nc. — —
Stiffkey, F. Long.

CYPERACEÆ.

SCIRPUS FLUITANS. Linn. K.T.S. . . . — — sc. —
„ MARITIMUS
b, compactus . . . . — nc. — —
Wells, H.D.G.
CAREX REMOTA. Linn. K.T.S. . . . — nc. — —
„ CURTA. Good. E.F.L. . . . e. — — —
„ OVALIS. Good. K.T.S. . . . — nc. — —
„ ACUTA.
var. gracilescens. F.W.G. . — — sc. —
„ LIMOSA. Linn. K.T.S. . . . — — sc. —
„ PILULIFERA. Linn. K.T.S. . . — — sc. —
„ VESICARIA. Linn. K.T.S. . . . — — sc. —

GRAMINA.

DIGITARIA HUMIFUSA. Pers. F.W.G. and Hb. Sal. e. — — —

[SETARIA GLAUCA. Beauv.] F.W.G. . . . e. — — —

ALOPECURUS GENICULATUS. Linn. K.T.S. . . — — — w.

PHLEUM PRATENSE.

b, nodosum. E.F.L. . . — — — w.

„ BOEHMERI. Schrad. K.T.S. . . — nc. — —

AGROSTIS SPICA VENTI. Linn. Hb. Sal. . . — — sc. —

PSAMMA BALTICA. R. and S. . . . . e. — — —

Caistor Marrams, Mr. H. G. Glasspoole.

MILIUM EFFUSUM. Linn. E.F.L. . . . — — sc. —

AIRA FLEXUOSA. Linn. E.F.L. . . . — — sc. —

AVENA PUBESCENS. Huds. F.W.G. . . . e. — — —

[„ STRIGOSA. Sch.] F.W.G. . . . — — sc. —

TRIODIA DECUMBENS. Beauv. K.T.S. . . — — sc. —

GLYCERIA PLICATA. Fries. K.T.S. . . . e. nc. sc. —

SCLEROCHLOA BORRERI. Bab. . . . . — nc. — —

Holkham, F. Long.

FESTUCA PSEUDO-MYURUS. Soyer. E.F.L. . . — — sc. —

„ SCIUROIDES. Roth. E.F.L. . . . — — sc. —

„ "FALLAX. Th." F.W.G. . . . e. — — —

„ DURIUSCULA

var. filiformis. Parnell. . . — nc. — —

Holkham, F. Long.

„ "OVINA. var. duriuscula.

sub-var. brachyphylla." Hackel. — nc. — —

Holkham, F. Long.

„ RUBRA. Linn. b, grandiflora. . . e. — — —

Caister, E.F.L.

„ „ „ "forma littoralis." Hackel. — nc. — —

Wells, F. Long.

BROMUS ERECTUS. b, villosus. . . . . — nc. — —

Holkham, F. Long.

TRITICUM PUNGENS. R. and S. . . . . — nc. — —

„ „ var. littorale. . . . . — nc. — —

Wells, H.D.G.

NARDUS STRICTA. Linn. Hb. Sal. . . . — — sc. —

SECTION III.

ACOTYLEDONOUS PLANTS.

Filices.

Asplenium viride. Huds. F.W.G. . . . e. — — —
Ceterach officinarum. Willd. F.W.G. . . — — sc. —
Osmunda regalis. Linn. . . . . — — sc. —
Scoulton, H.D.G.

Equisetaceæ.

Equisetum maximum. Lam. K.T.S. . . . — — sc. —
„ limosum.
var. fluviatile. E.F.L. . . e. — — —
„ hyemale. Linn. . . . . — — sc. —
"Arminghall. F. B." E.F.L.
Apparently extinct.

Characeæ.

Chara fætida. A. Braun. E.F.L. . . . — — sc. —
„ longibracteata. . . . . e. — — —
Ormesby, H. G. Glasspoole.
„ fragilis. Desv.
var. fulcrata. . . . . e. — — —
Hoveton, E.F.L.
„ hispida.
var. pseudocrinita. A. Br.
"Norfolk." English Botany, ed. iii.
Nitella glomerata.
a, genuina. . . . . — nc. — —
"Cley, D. Turner and Mr. Borrer, 1806." English Botany, ed. iii.
„ opaca. Ag. . . . . e. — — —
Yarmouth, J. J. Owles.

XXII.

FUNGI.

By Charles B. Plowright, F.L.S., M.R.C.S.

Read 26th March, 1889.

In October, 1872, and in March, 1884, I had the honour of submitting to the Society lists of Fungi found in the county of Norfolk. In the aggregate these included some fifteen hundred species. During the past five years the work of investigating the Fungus flora of the county has been carried on by my friends the Rev. Canon Du Port (J.M.D.P.) of Denver, Mr. Herbert G. Ward (H.G.W.) of Terrington St. Clements, and myself. In all about a hundred fresh species have been added to our previous lists. Personally I have devoted more time to studying the life history of two groups of parasitic fungi, the *Uredineæ* and the *Ustilagineæ*, than to field-work. The outcome of these researches has been, amongst other things, to show that our county is particularly rich in both these groups. For instance, no less than seven species of heterœcious *Puccinia* new to science have not only been detected, but have had their life-histories worked out by experimental culture, from material collected in Norfolk.

Agaricus (Lepiota) felinus. Pers. Middleton, North Wootton.
„ (Collybia) nitellinus. Fr. South Wootton.
„ (Omphalia) postii. Fr. Near King's Lynn.
„ (Pluteus) salicinus. Schæff. South Wootton.
„ (Nolanea) mammosus. Linn. Ringstead.
„ (Inocybe) incarnatus. Bres. Rackheath, J.M.D.P., Ryston Park, J.M.D.P., Castle Rising.
„ (Flammula) inauratus. Smith. North Wootton.
„ „ ochrochlorus. Fr. On a railway sleeper, King's Lynn.

Agaricus (flammula) juncinus. Smith. North Wootton.
,, (naucoria) arvalis. Fr. Great Yarmouth.
,, (stropharia) dulciculus. Schultz. Massingham Heath.
,, (hypholoma) hydrophilus. Bull. Mattishall, J.M.D.P.
,, (psathyrella) caudatus. Fr. Hockering Wood, J.M.D.P.
Cortinarius (phlegmacium) anfractus. Fr. Ringstead Downs.
,, (myxacium) vibratilis. Fr. Mattishall, J.M.D.P.
,, (hydrocybe) dolabratus. Fr. Mattishall, J.M.D.P.
Hygrophorus ovinus. Fr. Massingham Heath.
,, lætus. Fr. Massingham Heath.
Lactarius helvus. Fr. North Wootton Heath.
Russula duportii. Phill. Mattishall, J.M.D.P.
Hydnum diaphanum. Schrad. Terrington St. Clement's, H.G.W.
Clavaria rosea. Fr. Terrington St. Clement's, H.G.W.
Tremella folicola. Fckl. On *Phragmidia*, North Wootton Heath.
Ramularia rosæ. Fckl. On *Salix viminalis*, South Wootton.
,, pratensis. Sac. North Wootton.
Ovularia asperifolia. Sac. King's Lynn.
Phyllosticta bolleana. Thum. On *Hoya carnosa*, Neatishead, M.C.C.
Uromyces fabæ. Pers.
,, parnassiæ. D.-C. Irstead, M.C.C.
,, ervi. Wallr. South Wootton.
Puccinia (anteupuccinia) lapsanæ. Schultz. Great Massingham. Castle Rising, Bawsey.
,, ,, variabilis. Grev. Watlington.
,, ,, albescens. Grev. Mintlynn.
,, ,, apii. Wallr. Heacham, King's Lynn.
,, ,, vincæ. D.-C. Ashwicken.
,, (heteropuccinia) phalaridis. Plow. Æcidiospores on *Arum maculatum*, Teleutospores on *Phalaris arundinacea*. Well Hall Lane, Gayton.
,, ,, arenariicola. Plow. Æcidiospores on *Centaurea nigra*. Hemsby Beach, Rev. Canon Du Port. Teleutospores on *Carex arenaria*. C.B.P.

PUCCINIA (HETEROPUCCINIA) SCHŒLERIANA. Plow. and Mag. Æcidiospores on *Senecio jacobæa*, Teleutospores on *Carex arenaria*. North Wootton Heath, Roydon Heath.

„ „ PALUDOSA. Plow. Æcidiospores on *Pedicularis palustris*, Teleutospores on *Carex vulgaris*. Stalham, Irstead.

„ „ PERPLEXANS. Plow. Æcidiospores on *Ranunculus acris*, Teleutospores on *Alopecurus pratensis* near King's Lynn; South Wootton.

„ „ PERSISTENS. Plow. Æcidiospores on *Thalictrum flavum*, Teleutospores on *Triticum repens*. Watlington.

„ „ EXTENSICOLA. Plow. Æcidiospores on *Aster tripolium*, Teleutospores on *Carex extensa* (Dr. Long). Wells.

„ (BRACHYPUCCINIA) CENTAUREÆ. Mart. Mintlynn.

„ „ TARAXACI. Plow. King's Lynn.

„ (HEMIPUCCINIA) LYCHNIDEARUM. Link. Castle Rising, Mintlynn.

„ (MICROPUCCINIÆ) ADOXÆ. D.-C. Mintlynn, Castle Rising.

„ „ GLOMERATA. Grev. On *Senecio jacobæa*, Sandringham.

„ (LEPTOPUCCINÆ) MILLEFOLII. Fckl. King's Lynn.

„ „ CARDUI. Plow. King's Lynn.

ENDOPHYLLUM SEMPERVIVI. A. and S. Castleacre.

GYMNOSPORANGIUM CONFUSUM. Plow. Æcidiospores on *Crataegus oxyacantha*, *Mespilus germanica*, and *Pyrus vulgaris*, Teleutospores on *Juniperus sabina*. Downham, King's Lynn, Clenchwarton, Wiggenhall St. Germans, Terrington St. Clement's.

CRONARTIUM FLACCIDUM. A. and S. North Wootton.

CÆOMA LARICIS. Westd. Wolferton, Castle Rising.

USTILAGO TECTA. Jens. Wormegay.

„ NUDA. Jens.

UROCYSTIS AGROPYRI. Preuss. On *Triticum repens*, sea bank, King's Lynn.

ENTYLOMA BICOLOR. Zopf. North Wootton.

„ RANUNCULI. Bon.

ENTYLOMA CALENDULÆ. Oud. On *Calendula officinalis*, King's Lynn.

TUBERCULINA PERSICINA. Ditm. On *Rostelia*, *Æc. asperifolii*, Downham, Castle Rising.

CYSTOPUS LEPIGONI. De Bary. Hunstanton.

„ SPINULOSUS. De Bary. Hunstanton, Castle Rising.

AMBLYOSPORIUM UMBELLATUM. Harz. On *Aparies*, King's Lynn.

MORCHELLA CRASSIPES. Pers. Castle Rising.

HELVELLA PULLA. Holms. Black Hills Plantation, Castle Rising.

VERPA RUFIPES. Phil. Terrington St. Clement's.

RHIZINA UNDULATA. Fr. Castle Rising.

PEZIZA AURANTIA. Ed. var. ATRO-MARGINATA. Phil. Clenchwarton.

„ ISABELLINA. W.-G.-S. This species occurred abundantly in Hamond Lodge Park, Terrington St. Clement's, 1888, H.G.W.

„ LINTEICOLA. Ph. and Pl. King's Lynn.

„ INDISCRETA. Ph. and Pl. North Wootton.

„ OMPHALODES. Bull. Near King's Lynn.

HYMENOSCYPHA SCLEROTIORUM. Lib. Terrington St. Clement's, H.G.W.

„ FRUCTIGENA. Bull. Terrington St. Clement's, H.G.W.

„ CALYCULUS. Sow. Near King's Lynn.

BELONIDIUM CULMICOLUM. Desm. Near King's Lynn.

HELOTIUM GRAMINEUM. Phil. Near King's Lynn.

MOLLISIA ATRATA. Pers. var. ASPARAGI. Wint. Near King's Lynn.

„ JUGOSA. Ph. and Pl. Near King's Lynn.

„ DILUTELLA. Fr. var. SMYRNII. Hunstanton.

„ CERASTIORUM. Wallr. King's Lynn.

LACHNEA RADICULA. Sow. North Wootton.

„ GEASTER. B. and Br. Near King's Lynn.

LACHNELLA CUPRESSI. Batsch. Brandon: Mr. F. Norgate.

„ PTERIDIS. A. and S. Castle Rising.

„ PALLIDA. Rehm. Terrington St. Clement's, H.G.W.

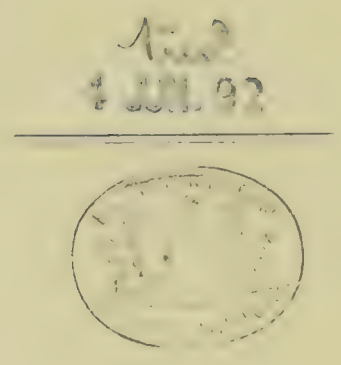
TAPESIA ROSÆ. Pers. Near King's Lynn.

OMBROPHILA RUDIS. Berk. Terrington St. Clement's, H.G.W.

CALLORIA CHRYSOSTIGMA. Fr. King's Lynn.

„ VINOSA. A. and S. Terrington St. Clement's, H.G.W.

CALLORIA RUBELLA. Pers. Terrington St. Clement's, H.G.W.
STICTIS PUNCTIFORMIS. Pers. King's Lynn.
CERATOSTOMA VESTITA. Sacc. Mattishall, M.C.C.
DIDYMELLA PROXIMELLA. Karst. On *Carex hirta*, King's Lynn.
DIAPORTHE DISCORS. Sacc. Castle Rising.
ELEUTHEROMYCES LONGISPORA. Ph. and Pl. Holt House Woods, Mintlynn.
HYPOCREA ARGILLACEA. Ph. and Pl. Dersingham.
,, VISCIDULA. Ph. and Pl. Brandon.
LOPHIODERMUM CARICINUM. Desm. and Rob. On *Carex arenaria*, Mintlynn.



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